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RECENT SURVEY AND EXPLORATION IN SEISTAN.*

By Colonel Sir HENRY McMAHON, K.C.I.E., C.S.I.

I had the honour of addressing this Society exactly nine years ago, when I read a paper on "The Southern Borderlands of Afghanistan."† That paper described the geographical work of the Baluch-Afghan Boundary Commission, of which I have been in charge, and which, after some two years' labour, had demarcated the boundary between India and Afghanistan from the Gomul river to Persia, a distance of 800 miles. That boundary-line ended at the top of the highest peak of the Koh-i-Malik-Siah mountain, which enjoys the proud distinction of being a point where three empires meet, *i.e.* India, Persia, and Afghanistan. This same mountain forms the starting-point of my present paper.

In my former paper I described the Baluchistan desert, with its barren mountain ranges, old volcanoes, and wide areas of gravel plain and sandhills. To-night I will endeavour to give you some description of Seistan, which is situated to the north-west of that country. I may note that it lies half in Afghanistan and half in Persia, and is about halfway from the Russian-Turkestan border and the Persian gulf. It is unnecessary, I know, to mention these details to an audience of the Geographical Society; but I am so often asked by kind friends

* Read at the Royal Geographical Society, April 9 and May 11 (Research Department), 1906. Map, p. 312.

† "The Southern Borderlands of Afghanistan," by Captain A. H. McMahon, C.I.E. Read at the Royal Geographical Society, February 22, 1897. Pages 393–415, *Geographical Journal*, vol. 9.

how I liked the Tibetans and how I got on with the Chinese, that I am reluctantly compelled to suspect that the position of Seistan is not so generally known as it should be.

Seistan is a country with a very ancient history and a great past. Time forbids my dwelling long on its past history. For that I must refer you to the many ancient Zoroastrian, Greek, Arab, and Persian historians who have written about it. Among modern writers on this subject, two members of this Society have attached great importance to Seistan, *i.e.* the late Sir Henry Rawlinson and Lord Curzon. The latter has devoted a very valuable chapter to this country in his monumental work on Persia. Sir Henry Rawlinson, when President of this Society, read a paper on Seistan * in January, 1873, thirty-three years ago. He reviewed the ancient history of the country, and, with the aid of the then recent geographical researches of General Sir Frederic Goldsmid, who had just returned from a mission of arbitration in Seistan, and who communicated the results of his explorations there in a paper to this Society,† endeavoured to identify the various places famous in ancient Seistan history with the old ruined sites brought to notice by Sir Frederic Goldsmid and members of his mission. That paper will be found of the utmost value and importance by any one who takes up archæological research in Seistan. It shows profound knowledge of the ancient historians, and is a masterpiece of close and accurate reasoning. After years of careful work in the country, we have found but little to correct, and have been able to definitely confirm most of the conclusions he arrived at.

Seistan is the birthplace of the legendary history and romance of Persia. Here is said to have lived the greatest mythical hero of past ages, the mighty Rustam, whose victories over demons and dragons, and the armies of the west and north, and even distant China, established the power of the Achœmenian dynasty. Seistan, too, was the home of Kai, or Kaikobad, the founder of the great Kayani or Achœmenian dynasty, which gave the world the line of kings, Cyrus, Darius, and others, who shaped the destinies of the whole world. Alexander the Great visited Seistan on his way to India in 330 B.C., and part of his army returned through that country. His historians speak highly of the civilization of the country, which was then called Drangiana, or Zarangiana.

Then came the Sakœ, or Scythians, who, although they only held

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* "Notes on Seistan," by Major-General Sir H. G. Rawlinson, K.C.B., President R.G.S. Read January 27, 1873. *Vide Journal of the Royal Geographical Society*, vol. 43, 1873, pp. 272–294.

† "Journey from Bandar Abbas to Meshad by Seistan, with Some Account of the Last-named Province." *Journal of the Royal Geographical Society*, vol. 43, 1873, pp. 65–83.

Seistan for a short time, yet left in it a lasting mark of their stay in the form of its present name, for Seistan is only the later form of Sejistan, and that of Sakœstan, or country of the Scythians. The Scythians were turned out about 275 A.D. The Arabs invaded and conquered the country in the 37th year of the Hegira, *i.e.* about 659 A.D., and held it for many centuries.

Up to about the tenth century Seistan was a very rich, prosperous, and civilized country; but its wealth brought its own punishment, for from that time it formed the victim of a long succession of devastating conquests by devouring hordes. Mahmud of Ghazni, Jenghiz Khan

HELMAND RIVER ABOVE BAND-I-SEISTAN.

Timurlane, Nadir Shah, and others conquered it, and left it a more and more impoverished and stricken country.

Timur, on his first inroad into Seistan, was repulsed, and he himself received an arrow-wound, from which he got his name of Timurlane, or Timurlang, *i.e.* Timur the lame. He vowed he would return and take a bloody revenge, and he carried out his threat only too well. He devastated the whole country, and put the inhabitants to the sword. Zaranj, the then capital of the country, made a gallant defence, but in vain. The skulls and bones lying in large numbers in the old ruin of Zaranj, now called Zahidan, testify to this massacre to the present day. To Timur or his son Shah Rukh is ascribed the crime of destroying the dams and weirs of the Helmand, on which the irrigation of the

country depended, and from the destruction of which the country has never recovered.

The ancient Kayani family, who claim descent from the original Kai, the founder of the Achœmenian dynasty, have made spasmodic attempts, in their long rule over the country in recent centuries, to restore the prosperity of the country, but in vain, and they, like their country, have gradually declined in prosperity and importance. Only a few members of this ancient family now survive in Seistan, and they are in very impoverished circumstances.

In succession from Nadir Shah, Seistan came, in 1747 A.D., into the heritage of Ahmad Shah the Afghan, and for the first time found itself under other than Persian dominion. Afghan rule in the country lasted over one hundred years, but was never more than nominal, and the Persians, taking advantage of intrigues between the rival local factions of Seistan itself, began to extend their influence over the country, and in 1866 occupied a portion of it with troops. The dispute which ensued between Afghanistan and Persia over this proceeding led to its being referred to the British Government for arbitration, and General Sir Fred. Goldsmid, who visited the country as arbitrator in 1872, laid down a boundary-line through Seistan. This settlement formally perpetuated what the course of local events had already brought about, *i.e.* the division of Seistan between Persia and Afghanistan, and ancient Seistan thenceforth ceased to possess any individual national existence as an undivided whole.

Sir Frederic Goldsmid related his experiences of Seistan before this Society in 1873, and I need not repeat what he said. Suffice to say that he was greatly hampered in his work by the obstruction and hostility of the Persian Commissioner and the Persian governor of Seistan. His movements were restricted, objections were raised to his flying the British flag in his camp, and difficulties of all kinds were placed in his way. He and his mission, after making all such inquiries and surveys as were possible during a short stay in the country under these very unfavourable circumstances, proceeded to Teheran, where the award was delivered. That award laid down on paper a boundary-line giving one portion of Seistan to Afghanistan, and the rest to Persia. From the Band-i-Seistan northwards to the Naizar or reed-beds on the Hámun shore, the main bed of the Helmand was defined to be the boundary.

The main channel of the Helmand then ran close to Nad i Ali, and thence northwards in almost a straight line. Later on, however, in 1896 it suddenly took a new course to the west of the old channel, along what is now called the Rud-i-Pariun. This in course of time led to disputes, for doubt arose as to whether the old or the new main channel was the boundary. Matters became still further complicated by disputes over the distribution of the water of the Helmand river,

on which both countries depend for their cultivation. The British Government was again called upon to arbitrate, and I was deputed, with a large well-equipped mission, to proceed to Seistan, and arbitrate upon both the boundary and the water disputes. We left Quetta early in January, 1903, and returned late in June, 1905, after a stay of some two and a half years in Seistan. We thus had ample opportunities of carefully studying the country, and I will give you to-night some of the results of our observations.

I first invite your attention to the map of Seistan. We found, on our arrival, the existing maps inaccurate and somewhat misleading, and also full of blank spaces showing unsurveyed tracts, some of which had

HELMAND RIVER AT KUHAK, SHOWING MOUTH OF THE ROD-I-SEISTAN AND THE BAND-I-SEISTAN WEIR.

never been visited or seen by Europeans. Mr. Tate, the survey officer of our mission, and his able survey staff made complete new surveys of the whole country, both on a scale of 4 miles and 1 mile to the inch, and we filled up one after another all the unsurveyed blanks in Seistan and the surrounding country. No less than 38,000 square miles were thus surveyed, and the difficulties and dangers attending this task will be illustrated by what I will tell you later on.

The Seistan of the present day has an area of about 7006 square miles, of which 2847 square miles are in Persian and 4159 square miles in Afghan territory. The extreme fertility of the soil and the abundance of water for irrigation make Seistan a very rich country in the matter of agricultural products. Its population is about 205,000,

but the country, even with the lazy, happy-go-lucky methods of the present day, furnishes a very large amount of grain and food-supplies in excess of local requirements, and it could, of course, be made to furnish very much more. Under improved government, Seistan could, with but little trouble, be made into a second Egypt. It was so once, and could become so again. If I deal to-night chiefly with the deserted portions of Seistan, I beg you not to forget the extent and richness of the inhabited portion.

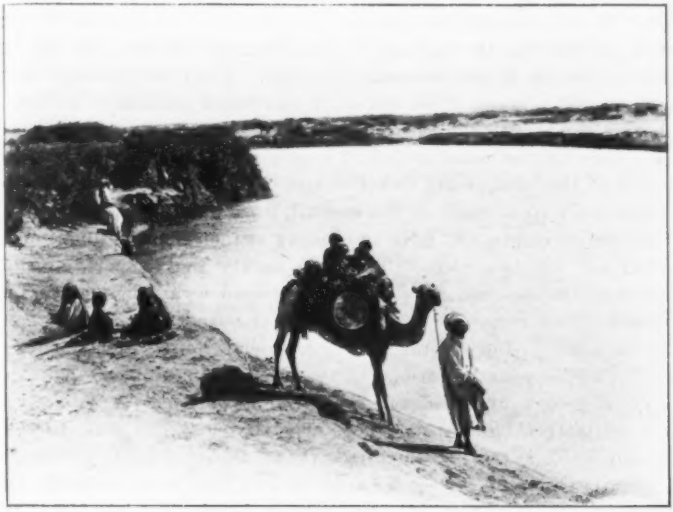
With the exception of those portions of the country which consist of high barren plains, covered with a thin layer of gravel, and the cliffs which fringe those gravel plains, and in places the shores of the Hámun, Seistan presents to the eye a wide expanse of dead level country. Everywhere, except in the present inhabited portion, it is bare and desolate, destitute of vegetation or human life. In the inhabited and cultivated tract the country is intersected by a labyrinth of canals, large and small. No trees are to be seen in Seistan except on the river-banks or in Mian Kangi, the tract between the two main branches of the Helmand, where a tangled growth of low tamarisk jungle covers the face of the country. This is almost impenetrable, and is the home of innumerable jackal and wild pig.

The cliffs I have mentioned are vertical bluffs from 30 feet to several hundred feet in height, and, when seen from near, are striking features of the landscape. Elsewhere there is nothing to break the dead monotony of the flat horizon, except old ruins, and here and there a modern village of domed houses, picturesque in the distance, but dirty and squalid on nearer approach. Everywhere, except on the higher gravel plains, are ruins. Elsewhere, wherever one looks in Seistan, whether in the desert tracts or in the now inhabited portion of the country, are ruins. No country in the world contains so many. They are to be seen in all stages of decay, from shapeless mounds to high imposing structures of great size. They stretch everywhere as far as the eye can reach. A few, such as a minaret at Nad i Ali and that of Mil-i-Kasimabad, are of burnt brick; the rest are of burnt brick only at their base, and of sun-dried brick above. The regrettable absence of stone in Seistan has deprived this country of the lasting monuments of a still more remote past which stone buildings would otherwise have afforded.

It may seem strange that mud-brick buildings should live to the great age of some of these ruins. It must be remembered that their walls are always thick, that the Seistan soil makes bricks of excellent durable quality, and, more important still, there is little or no rain in Seistan. The annual rainfall only amounts to some 2 to 3 inches. The villages of the present day are, in the greater part of Persian Seistan, collections of domed houses generally built on mounds. In Mian Kangi and Afghan Seistan the villages are mostly collections

of wattle and daub huts. The capital of Persian Seistan, Nasratabad,* is merely a village surrounded with high walls. Here are the British and Russian Consulates.

Round the north and north-west of Seistan, as shown by the blue-coloured portion of the map, is the Hámun, or lake area, into which the various Seistan rivers discharge their surplus waters. As one approaches the shores of the Hámun the scenery changes. The monotony of a flat horizon of dry land gives place to one of water and reeds. Dense reed-beds, called naizar, skirt the Hámun in many places. These beds are often several miles in width, and composed of high reeds 10 feet or more high. They look impenetrable, but narrow



THE ROD-I-SEISTAN.

winding lanes exist in them, known only to the Sayads, a strange aboriginal race of Seistan, who live by netting fish and water-fowl, and who pole their "tutins"—long cigar-shaped reed rafts—through these lanes. The Sayads live all the year round at the water's edge, in huts made of reeds, and they change their abodes as the waters advance or recede. They have a language of their own, and are an unsociable people, suspicious of strangers, ever ready to decamp and hide themselves in the naizar if they think a tax-collector is in the neighbourhood. Beyond the reeds lie vast open stretches of water, extending sometimes to the horizon.

* The capital is always spoken of in Seistan as Shahr-i-Seistan (city of Seistan), or Seistan. The name Nasratabad is seldom used locally.

All Seistan, both the high gravel-covered plains and lower lands, is composed of alluvial soil. In strange contrast to this, there stands up by itself in the Hámun, as a prominent feature of the Seistan landscape, a solitary hill of rock, 496 feet high. It is called the Koh-i-Khwaja, and many legends centre round it. On its southern slopes are the massive ruins of Kakhaha, of the origin and era of which we know nothing. The then ruler of Seistan, in later times, for seven years successfully withstood on this hill the siege of Nadir Shah, the Persian king. Closer examination shows it to be a hill topped with a cap of basaltic lava some 200 feet in thickness, below which is alluvial silt of first brick-red, and lower down yellow colour baked and burnt into a hard crystalline condition. Mr. Ellsworth Huntington is of opinion that this hill contains the core of a volcano; but I am inclined to think, from the fact that the lava cap slopes downwards to the north-east, that this conclusion is not necessarily correct. From the quarries on the top, in which remains of old and much-weathered portions of mill-stones abound, one sees that in some very distant time the people of Seistan came here for that useful article. The rock is too hard for the degenerate people of the present day to cut or make use of. The numerous raised tombs, built up of rocks on the summit, have puzzled many travellers. They are all empty, and have an opening at their ends or sides. Their object and use is obvious. They are merely the temporary resting-places of the departed, who have been stored away there until their relations could remove to sacred Meshed for burial.*

[So much for the general scenery and characteristics of Seistan. I now bring to your notice one or two interesting problems which the physical geography of Seistan presents for solution. It will be seen that Seistan is a large basin some 7000 square miles in area and without any outlet to the sea, which receives all the drainage of a vast tract of country, over 125,000 square miles in area, girt on all sides by high mountain ranges. The Helmand, Khash, Farah Rud, and Harut Rud rivers flow into the Seistan basin, and it receives the flood waters of many torrent beds coming from the mountains on the west. The Khash, Farah Rud, and Harut Rud drain the country to the north as far as the Paropamisus and Hazarajat (Hazara) mountains. They do not flow into Seistan all the year round, as their upper waters, during a portion of the year, are all taken off for irrigation in the higher reaches, but in spring and early summer they are rivers of no small size, and bring large volumes of water into Seistan.

The principal river of Seistan is the Helmand. It drains a large portion of Afghanistan. Its sources rise as far away as near Cabul,

* The portion of the paper in brackets formed the subject of separate discussion at a meeting of the Research Department of the Society, held on May 11, 1906. The record of that discussion will be found after the conclusion of the paper in the next number.

and extend to the lofty watershed of the snow-covered mountains of Hazarajat. It is some 600 miles in length, and its volume, on reaching Seistan, varies from a normal minimum of some 2000 feet per second at low river to 50,000 and 70,000 cubic feet per second in ordinary flood seasons, and to as much as 600,000 and 700,000 cubic feet per second in years of abnormal flood, such as occurred in 1885. It will be seen from this that the Helmand is a very large river. It is, moreover, the only large river in Southern Asia between the Indus and the Tigris. Down to Bandar-i-Kamal Khan the Helmand flows along the bottom of a narrow deep bed of 1 to 2 miles in width, which cuts through a wide alluvial gravel-covered plain. This river-bed presents all the normal

RUINS OF THE CITADEL OF ZAHIDAN, THE ANCIENT ZARANJ.

features of an ordinary trough of erosion. The alluvial cliffs, 200 to 250 feet high, which form the walls of this cutting on either side, leave the river near Bandar-i-Kamal Khan and recede northwards and southwards, as shown on the map, at the point where the Helmand enters the Seistan delta.

After arriving in Seistan, the Helmand at the present time divides into three branches. The first, called Rud-i-Seistan, is really a big canal which takes off at the Band-i-Seistan. Persian Seistan largely depends on the Rud-i-Seistan for irrigation. To divert sufficient water into this channel during the early winter, or low river season, a gigantic weir, made of densely packed bundles of Tamarisk branches, is thrown

across the Helmand every autumn when the river is at its lowest. About Christmas-time the rising river breaches this dam, and gradually carries it away. This "band," or weir, is from 70 to 100 feet wide, some 1700 feet long, and in height from 5 feet at the sides to 15 and 20 feet in the stream. The main channel of the Helmand is now the Rud-i-Purian, and the third is now a smaller channel, the Nad-i-Ali channel, which, as stated before, used to be the main channel. All three branches discharge their surplus waters into the Hámun, which encircles the north and west of Seistan. The Khash, Farah Rud and Harut Rud discharge their waters also into this Hámun, which becomes in the flood season a vast sea more than 100 miles in length, and varying from 5 to 15 miles in breadth. Every few years, when its level reaches a certain height, it escapes through the Shelag channel into another large and still deeper lake depression, called the Gaud-i-Zirreh. It did this during the whole month of August, 1903, while we were in Seistan.

The Helmand and other Seistan rivers in flood-time come down very heavily laden with fine silt, and I should mention here that the proportion of silt in the Helmand is extremely high. We found it on occasions to be as much as one part of silt to 127 parts of water, a figure which very few rivers in the world can surpass. This silt is deposited by floods over the country, and the natural tendency is for the rivers and canals to build themselves up with their own silt on to a higher and higher level, until in course of time they are running along the tops of ridges higher than the surrounding country. This goes on until some obstruction or big flood causes a breach in their banks, and they desert their old channel and divert themselves by a new channel on to lower ground. This is what happened when the Helmand deserted its old Nad-i-Ali main channel in 1896, and made for itself a new one in the Rud-i-Pariun. Everywhere in Seistan are traces of old deserted river and canal beds due to this natural cause.

As seen in the map, the present Helmand with its branches forms one delta; and to this delta is confined all the cultivated and populated area of Seistan. This has not always been the case, for we find in what is called the Tarakun-Ramrod tract numerous old ruins of great extent and traces of old canals and cultivation. We find here, also, the traces of old river-beds, and we find that the Helmand used to flow down here and use this delta just as it now does its present one. Its surplus waters discharged into the Gaud-i-Zirreh, just as they now do into the Hámun.

Again, let us examine the waterless tract on the east of the present Helmand. This, before our arrival in Seistan, was a blank on our maps, and we were the first to explore it. Previous travellers had reported rumours of the existence of old ruins in this tract also, but no one had entered this waterless desert or seen the ruins. We found not only ruins

of countless numbers and great extent throughout all this tract, but traces of ancient canal systems and ancient river-beds. In fact, the extent and nature of the ruins, the character of the relics found in them, such as seals, pottery, china, and glass, and the magnitude and perfection of their canal systems show that this must have been, not only a former delta of the Helmand, but the delta used by the Helmand in, as far as existing ruins testify, one of the most prosperous times of Seistan history. Of all the vast ruins of this tract, now mostly buried or half

THE MIL-I-KASIMABAD, SEISTAN.

buried in sand, the largest would seem to be those now known as Sarotar. This series of ruins extend from near Kala-i-Fath, past Sarotar, for some 60 miles northwards in an unbroken line to beyond Chakansur. The northern ruins of this series are free from sand, some of them, such as Amiran and Chihal Burj, being in a wonderful state of preservation. While this delta was used by the Helmand, the surplus waters discharged themselves into a big depression which we found to exist along the east, and which we have called Lalla Nawar, and which must have been the Hámun of those days. Again, what is now called

the Sena Rud marks the course of an ancient bed of the Helmand. This discharged the river into the southern portion of the present Hámun, and its delta comprised portions of both the present inhabited delta and the Ramrod delta. No traces of old ruins are to be found on the Sena Rud, and it seems to have been in use in pre-historic times. It may perhaps have been the river-bed of a portion of the period to which the palæolithic remains, to which I will refer later, belong.

Thus we find Seistan is composed of at least three deltaic areas, each with its own Hámun for flood waters to escape into. The traces still visible, of not one, but a succession of old river-beds in each tract, show that each of these deltas has been used by the river, not once, but many times in past ages. As the Helmand in the course of ages swung round from side to side, one delta was abandoned and another came into use. What was a Hámun at one time became a dry plain at another, and so on. Thus we find immersed under the waters at the north-west course of the present Hámun the ruins of the city of Sabari Shah, while Lalla Nawar is now a waterless desert, and the Gaud-i-Zirreh very seldom receives any water. The population have, of course, followed the river, and even in historic times the capital of Seistan has changed its site from delta to delta. Ram Shahristan and Agriaspa, the capital of Seistan Drangiana in Alexander's time, is, I think, now marked by the ruins of Ramrod, in the Tarakun delta, while Zaranj, the capital of the times described by Arab historians, and which Timurlang destroyed, is undoubtedly the Zahidan in the present delta. To what era we are to ascribe Sarotar, I feel some doubt, but I think we shall not be far wrong in making it a very ancient capital—that, perhaps, of Indo-Parthian times. Older than these are the innumerable shapeless mounds of burnt bricks scattered over the whole country, marking the sites of earlier towns, and still more ancient capitals. Eastwards and westwards the Helmand has swung from age to age, piling fresh silt over the face of the country, and burying still more ancient ruined sites below the surface. These we only see occasional traces of when the river cuts out a new channel, or a deep wind-scour temporarily exposes a portion of some buried ruin.

We come now to the most puzzling of the many problems which the study of Seistan presents. If we try and calculate the mass of silt which the rivers bring into Seistan each year, we soon work up to big figures. We should be justified, therefore, in supposing that the general level of the Seistan deltas is gradually rising, for there is no outlet from Seistan, no means by which the water can carry the silt elsewhere, and bit by bit all the silt that comes down is placed on top of what is there before. Do our recent surveys and observations corroborate this supposition? Far from it, for we find all round the Seistan area higher terraces of alluvial silt. These are clearly marked by the wave-cut cliffs which fringe the Hámun in places, and by the high cliffs which

mark the edge of the Dasht-i-Margo, on the east of Seistan, and which have their counterpart on the west of Seistan in the old alluvial deposits of corresponding height, still visible on the sides of the mountains and mountain glaces. In other words, the former level of the Seistan alluvial area must have been at least 400 feet above the present level. The only solution of the problem I can suggest is that the Seistan area has gradually subsided, owing to the weight of silt deposited on it. Such subsidence is, I believe, not unknown in deltaic areas, but hardly, perhaps, to the extent shown in Seistan. What has become of all the superincumbent earth which buried Seistan when it lay 400 feet below the then surface of the ground? What becomes of

RUINS OF TARAKUN, SEISTAN.

the silt that is now brought down every year; and what becomes of the material of the cliffs, which are still being cut away by water and wave action? There is no outlet to any sea, no tides and currents to carry the silt away to that sea.

If Seistan began by being a deep hole, and if this hole is gradually filling up, the aggradation or rising of its floor would long ago have shown signs of reducing the gradients of the lower reaches of the Helmand by checking the velocity of the river and causing deposit of silt. There is no sign of this, and the gradient of the present river resembles that of the ancient beds by which the river came in old days. The only solution of the problem seems to be the fact of a gradual but steady subsidence of the whole Seistan basin.

Mr. Ellsworth Huntington, of the Carnegie Institute of Washington, who visited Seistan while we were there, has recently written some very interesting notes * on that country. He took great interest in the old gravel beaches and other old high-water level marks which abound in Seistan. He attributes the changes in water-level to climatic oscillation, and to glacial and interglacial epochs. As an alternative suggestion he hints at the possibility of the Helmand having oscillated from one side of Seistan to another. We have since proved, as I have shown above, that the Helmand and other Seistan rivers have continually swung from side to side in the past, and this we know to account for many of the old beaches and high-water marks in Seistan. I regret that I did not bring to his notice the theory I have now propounded, *i.e.* that the Seistan deltaic area as a whole is undergoing gradual but incessant subsidence.

Another problem which confronts one on first considering Seistan is, what becomes of the great volume of water which its rivers pour into it? The Hámun is nowhere very deep, only about 15 feet in the deeper depressions, and not more than 4 to 8 feet over the remaining area at flood-time. Its extent rapidly shrinks after the flood season is over, and by winter large tracts of it have dried up. We thought at first that there must be some subterranean outlet to account for all this, but soon found that this was not the case. Not only is there no such outlet, but the bottom of the Hámun is extraordinarily water-tight, and very little loss occurs from absorption. Evaporation, however, we found in Seistan to be very rapid. Mr. Ward's observations and calculations show that no less than 10 feet of water is consumed by evaporation alone in the course of the year. In other words, a lake 10 feet deep is removed by evaporation alone in a year. The heat of the Seistan summer and the extraordinary wind of that country easily account for this high rate of evaporation, which renders it unnecessary to search for any other explanation regarding the annual recession of the lake area.

So much for the disposal of the silt and the water. What becomes of the salt? It is well known that inland seas which have no outlet are apt to become, through evaporation, more and more salt, until they become in some cases lagoons of brine with margins of solid salt. In Seistan, where so much water is consumed by evaporation each year, one would expect the salting process to be very rapid. This is far from being the case. The Hámun is singularly free from salt, and the water is drinkable. The Helmand water, it is true, is very pure, but it is too much to expect that either the Helmand water or the water of

* "The Basin of Eastern Persia and Seistan." By Ellsworth Huntington, Carnegie Research Assistant. *Vide* 'Records of the Carnegie Institute Expedition of 1903,' pp. 219-317.

every other Seistan river is so absolutely free from salts as to account for the freshness of the Hámun. Nowhere in the Hámun area is there any trace of a salt * deposit. The problem may be partly explained by the fact that the Hámun every ten years or so is flushed out by an overflow into the Gaud-i-Zirreh, but I do not think that this is a sufficient explanation in itself, and the problem awaits further elucidation. When the Hámun water overflows through the Shelag, the water in the Shelag is drinkable. Within a few months of the Shelag ceasing to flow, the water, which is always to be found throughout its course in large stagnant pools, is pure brine, with solid salt-crystals round the margins. The water of the Gaud-i-Zirreh, also, as it dries up, leaves a

A PORTION OF THE RUINS OF RAMROD, SEISTAN.

thick deposit of salt. The contrast between the conditions of the Hámun and the Gaud-i-Zirreh in this connection is very curious, and requires explanation.

I come next to another very curious phenomenon in Seistan. This is the wind. If ever a country merits the title of "land of the winds" it is Seistan. Every one who has visited Seistan or written about Seistan has mentioned its celebrated wind, called the "Bad-i-sad-o-bist roz," or wind of 120 days, which blows in the summer. Few of

* The salt efflorescence which comes to the surface in places in Seistan, as in every other country, and more frequently near the Hámun margin, is of course formed by capillary attraction from the ground below, and must not be confused with salt deposited by water from above.

these have had the misfortune to experience it, but as we went through two seasons of this wind we are able to say something about it. It more than justifies its reputation. It sets in at the end of May or the middle of June, and blows with appalling violence, and with little or no cessation, till about the end of September. It always blows from one direction,* a little west of north, and reaches a velocity of over 70 miles an hour. It creates a pandemonium of noise, sand, and dust, and for a time gets on one's nerves; but it is in reality a blessing in disguise, for it blows away the insects which from April to June make life in Seistan a perfect purgatory, mitigates the awful summer heat, and clears the country of typhus, small-pox, and other diseases rife in the country in May and June. This Bad-i-sad-o-bist roz is not felt in the mountainous country west and north-west of Seistan. It is said to be even more violent in Lash Jowain than in Seistan. It is less violent in Herat, and rapidly decreases in violence south of Seistan, and is but little felt on the Nushki Robat trade-route. One would think this 120-day wind enough, but violent winds prevail all through the winter from December to April, and blizzards are of constant occurrence. These winds always come from the same direction. The winter blizzards are terrible, and the wind attains a terrific velocity. In a blizzard at the end of March, 1905, the anemometers registered a maximum of 120 miles an hour. The average velocity for a whole sixteen hours was over 88 miles an hour.

The extraordinary frequency and violence of the Seistan wind, and the regularity with which it blows from the same quarter, are very remarkable. That it has blown from the same quarter in past ages is proved by the fact that all the ruins of Seistan are built at the same angle, with their front and back walls at a right angle to the wind, and their side walls at the same angle as the wind. No wind can blow with such violence and frequency without leaving its mark on the country. Its effects are everywhere visible in Seistan. Everything looks wind-swept and wind-stricken. There are no trees except the tangled thickets of low tamarisk which fringe the rivers and cover the lowlying tract of Mian Kangi between the Nad-i-Ali and Rud-i-Pariun rivers. These by their denseness protect each other from the wind, and afford protection to a few Babylonian willows, which have taken advantage of their protection to raise themselves into trees. Over the greater part of the country not a single tree exists.

The present villages and habitations are all built with their backs presenting lines of dead wall on the windward side. The old ruins are oriented at exactly the same angle, on account of the wind. The effect of wind is everywhere visible on these ruins. Their bases are undercut by wind as though by water-action. The thickness of the walls, the

* Between 316¼° and 333¾°.

excellent quality of the burnt bricks made and used by the ancient inhabitants for the lower courses of their buildings, and the extreme hardness and durability of the Seistan soil when made into the sun-dried bricks of which the upper portions of the ruins are composed, have withstood the destructive effect of the wind in a wonderful manner, but in the older ruins we often find that the walls facing the wind have entirely disappeared, and only the side walls remain, while in still older ruins only one or two solitary pinnacles remain to mark what were once large, massive, and extensive buildings.

The wind has buried large tracts of the country under sand. Many of the old ruined towns are wholly or partly buried in sand, and this

GLIMPSE OF OUTER LINE OF WALLS OF SAR-O-TAR RUINS, SEISTAN.

burying process goes on all the year and every year, and is covering up not only valuable lands, but inhabited villages. In Seistan, as elsewhere, the invading army of sand is preceded by lines of skirmishers in the form of travelling "burkhans," horseshoe-shaped sandhills, which steadily advance until they meet some obstacle, which retards them until the reserves come up to their support and bury all before them under hills of sand. I will give you a couple of instances illustrating the rapidity of this burying process.

On our arrival in Seistan, we found Kila-i-Nau, a big and flourishing village, built on the south side of a high ridge for protection from the wind. Before we left, the sand had attacked that ridge, surmounted it, and buried the village, forcing the inhabitants to build a new village

elsewhere. An example of still greater rapidity was afforded at the village of Kila-i-Kohna. Up to June, 1904, this village had a large deep pond on its northern side. By September, *i.e.* in less than three months, this deep pond was converted into a sandhill some 10 feet high.

The wind, however, does not confine its energy to burying only. While it covers some tracts deep in sand, it also sweeps other tracts clear of sand, rendering valuable land available for cultivation, and exposing long-buried ruins once more to view. These are, however, only the milder effects of wind-action. The Seistan wind, in its more destructive moods, has in places removed, not only sand from place to place, but has scoured away the whole face of the country. Everywhere we find the sides and banks of the canals which irrigated the lands on which the dwellers of the old ruins depended, left standing like walls high above the present surface of the surrounding land. These banks, having been hardened by water, have withstood the action of the wind better than the surface of the land, which has all been blown away to a depth of several feet. This depth in places is very considerable, and we find the outlines exposed of still older canals which existed at some yet earlier age, and which must have been buried deep in the ground when the canals above them, old as they are, were in use.

Some very startling evidences of the way in which the wind has scoured away and removed the old surface of the country, are to be found in the south-west corner of Seistan, which was probably once the richest and most populous part of the country. Owing to its remoteness from the beaten track, and its present inaccessibility from want of water, I do not think it has ever been visited or explored by any Europeans except ourselves. I refer to the desert track through which the boundary-line runs between the Sena Rud and the Shelag. Here we find wind-scours 20 feet or so deep, which have left isolated mounds to mark the height of what used to be the surface, and which show that the present general surface at these places is at least 20 feet lower than it used to be. I say, at least, because the mounds are themselves wind-worn, and it is therefore impossible to say how high above the present surface the old surface was when it was last cultivated and used by man. That it was once a wide flat surface capable of extensive cultivation, we know from the broken pottery which is found here lying everywhere in extraordinary profusion, testifying to a very large population; moreover, a very ancient population, because the pottery is of the primitive red type which is familiar to experts as denoting great age. Even an amateur can detect how much older it is than the more finished pottery that abounds in the old ruined sites of Seistan.

But what are the rounded mounds that abound in countless numbers in this tract, and which catch the eye by reason of their black colour? Closer inspection shows that the colour is due to these mounds being

covered with black pottery and bits of black stone. This black pottery is, I think I am right in saying, the oldest form of pottery known, and one of the first indications of dawning civilization in primitive man. The black stones are bits of hard black lava and volcanic tuft, and other rocks common in the distant mountain ranges west of Seistan, but curious things to find here in this alluvial region. As one turns them over, the idea strikes one that they seem to be chipped into shapes unusual in the ordinary stone. Some look as if attempt had been made to fashion them into something, and others as if they were chips from other stones. Here and there we find what is evidently a spear-head, a knife, or a rudely fashioned axe-head. Some are made of black volcanic rock, others are of better quality, delicate implements of obsidian and agate and so on, evidently for the use of the *élite* of those days. Stone implements they are, of the palæolithic type. I leave it to experts to decide what age these belong to. If palæolithic experts are to be trusted, the users of such implements date back to many tens of thousands of years ago. Be the thousands of years what they may, enough has been found to prove that the age of past dwellers in Seistan is of very respectable antiquity, and in itself sufficient to give interest to that country.

Let us return to the ever-present Seistan wind. There are to be found scattered over the southern tract of Seistan, in the middle of the high gravel-plains of that region, a number of very curious depressions, large holes, as it were, cut out of the surface of the country. Some are very large, several square miles in area, and some 200 or more feet deep. Some of these depressions are connected with each other by gorges, others are connected by gaps in their side with the lower plain of Seistan, and through these gaps floods have at times found their way and formed large and sometimes deep lakes. Others, again, are isolated depressions, having no outlet at all. How were these formed? Ordinary explanations, such as water-action, subsidence, and so on, fail to apply. After much consideration, I have come to the conclusion—I record it with diffidence—that they have been dug out purely by wind-action. This may seem startling, but I must point out that all I have seen have a long axis, which more or less coincides with the direction of the wind. The few that are irregular in shape can, I think, be accounted for by the supposition that they originally formed two or more separate depressions which have gradually become merged into one. While advancing this theory to explain these minor depressions, I do not go so far as to suggest that it accounts for the huge depression of Seistan itself.

The Seistan wind, however, being such as it is, and its effects on the landscape being so very marked all over the country, we are bound to attribute to it the removal of some considerable portion at least of the silt which is yearly brought into Seistan.]

The above remarks may serve to bring to notice some of the interesting features of Seistan, but space forbids my either dwelling more fully on them or discussing many other interesting problems connected with the physical geography, archæology, and ethnology of the country. Our mission collected an immense amount of information on these and kindred subjects, and this information is being placed permanently on record in the form of official publications.

Mr. Ward, the expert irrigation officer of the mission, who was indefatigable, with the aid of his able staff, in collecting every manner of miscellaneous information, is, and has been for the past nine months, engaged in editing and putting these records through the press, so some idea can be formed of their extent. Mr. Tate, our survey officer, who is an archæologist of no small experience, has also written a valuable note on the archæology of the country, which I hope will soon be published. With the aid of the data thus collected, some advance may be made in elucidating the various interesting problems of this country. Few countries in so small a compass contain so many and varied evidences of past events, both physical and human. It offers unique opportunities for the study of physico-geographical phenomena and their relation to human life.

In the existing population we have, it is reasonable to believe, some of the purest types extant of the ancient Aryan race, and a more thorough study of all that Seistan has to teach us may throw valuable light on the early origin and history of the Aryan race, and on the wider and still more important subject, the physico-geographical history of a large portion of Central Asia. The eminent American experts who, under the auspices of the Carnegie Institute of Washington, are working at this subject in Turkestan and Transcaspia, have already had their attention called to the importance of Seistan as a key to similar problems in larger areas by one of their number, Mr. Ellsworth Huntington. I have already referred to his interesting notes on this country, and if some of his conclusions, made during his short stay in Seistan, fail to agree with the results of observations made by us during a long stay in the country, with all our advantages of a large and capable staff, ample means and equipment, the necessity is demonstrated of a still longer and more thorough research in this country.

We have had gratifying proof to-night of the brotherly interest which the United States take in our geographical work in the ice-bound Antarctic, and it will interest you to now learn how Americans and ourselves are also working hand-in-hand in the geographical problems of the arid deserts of Central Asia.

(*To be continued.*)

THE ECONOMIC GEOGRAPHY AND DEVELOPMENT OF AUSTRALIA.*

By J. W. GREGORY, F.R.S., D.Sc., Professor of Geology in the University of Glasgow.

IV. Labour-supply.

A. *Growth of Population.*

This growth of the manufacturing industries is all the more remarkable, as it is often held that it is neither economically possible nor politically desirable, for Australia to develop into a great industrial state. But it is generally conceded that Australia wants a larger population. The Australians are at present somewhat overhoused. Railways run through empty bush at a loss, where with an adequate adjacent population they would yield handsome profits. Large sums have been spent on irrigation works that have failed financially, because there were not enough people to supply the careful labour, by which alone the water could be profitably used. But the cry of the emptiness of Australia is greatly exaggerated. It is true that as yet only the coastal districts are peopled, and so the mean density is 1·5 per square mile, which is practically the same as Canada. But most countries have their scantily occupied areas. In our own overcrowded island we have Sutherland with its 2028 square miles and population of 10 to the square mile. Considering its conditions and position, Australian population has grown with unprecedented rapidity. Sir Jervoise Baines† has pointed out, that if we separate Australia into the inhabited and practically uninhabited districts, the settled districts are fairly well peopled for a pastoral and agricultural country. The average density per square mile of the densely peopled districts of Victoria is 48·94, and of the sparsely peopled only 1·39. In Queensland the densely peopled districts have 22·28 per square mile, and the sparsely peopled districts only 0·07 per square mile. The rate of increase of the population compares well with that of either America or South Africa.

In the century between 1673 and 1775, the population of the United States grew from 160,000 to 2,803,000, and Canada has taken over two centuries to reach 4,500,000; but the Australian population has grown from 6500 in 1800, to 3,773,248 in 1901; and if we compare the growths of population in the last half-century, we find that the percentage increase in Australia has been greater than in either the United States or Canada.

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* Continued from page 145.

† J. A. Baines, "A Census of the Empire," *Journ. R. Stat. Soc*, vol. 66, 1903, p. 12.

	U.S.A.	Canada.	Australia.
1840	17,063,000	1,690,000	(1841) 206,095
1850	23,192,000		(1851) 403,889
1860	31,443,000	(1860) 3,360,000	(1861) 1,153,973
1890	62,481,000	(1887) 5,020,000	(1891) 3,183,327
1900	76,356,000	5,528,847	(1901) 3,773,248

Nevertheless, though Australia has done well in attracting population, it needs to do still better. It has come to a pause in its increase, the cause of which need not here be discussed. But in face of the agricultural depopulation in parts of the British Isles, it is not surprising that there is no rush of people to agricultural pursuits in the back blocks of Australia. The best chance that the past rapid increase in the density of population will be maintained, is by the growth of manufacturing industries. In this important step in Australian development, Victoria has so far taken the lead; but the great coalfields along the coast of New South Wales should make the district between Sydney and Newcastle the manufacturing metropolis of Australia.

B. *The Aborigines.*

There is, however, an easier and quicker alternative method of increasing the Australian population. Australia might encourage the introduction of coloured labour. There was no chance of getting such labour from within Australia. When colonized, the continent was practically empty. The total aboriginal population at the beginning of last century is estimated at about only 150,000, and according to Coghlan it is now about 153,000. When Victoria was settled in 1836, it was occupied, according to the official estimates of that time, by only some 6000 black fellows. The aborigines make magnificent stockmen, and so would gladly have been preserved. They belong to the same great race group as ourselves—the Caucasian, but were of that nomadic type which has always perished before the advance of a settled civilization. In spite of the best efforts of the Australian Government to protect and preserve these people, they have died out before the spread of European diseases, and the change in life rendered necessary, as the wild game was replaced by sheep and cattle. There is a reported increase in the number of aborigines in recent years in the northern parts of Westralia and the Northern Territory; and there has been an excess of births over deaths in one of the aboriginal reserves in South Australia.

Nevertheless, it is very doubtful whether the race can be permanently saved. Some criticisms of Australia imply that it once had a dense population, which has been ruthlessly exterminated by the settlers. We hear yarns in the smoking-rooms of steamers about parties of settlers having, in the early days, gone out black-fellow shooting. But there seems very little foundation in fact for such stories.

The destruction of the Tasmanian aborigines was complete long before Tasmania was allowed self-government, and while the island was under British military rule; and the peaceful collection of the remnant into the reserve upon Flinders island was accomplished by a private settler, Robinson. The aborigines throughout Australia have always had the warm championship of men who were keenly interested in them, and always ready to defend them against oppression. The emphasis with which the authorities, in the earliest days of the Port Philip settlement, threatened to hang any white man convicted of murdering a black fellow, showed the determination of the Government to deal even justice between the two sections of the inhabitants.

C. *Asiatic Immigration.*

The north-western ports of Australia are only four days' steam from that overcrowded corner of Asia where dwells about half of the human race. The daring Malay seamen knew of the existence of Australia centuries before it was known in Europe. The people of south-eastern Asia had their chance of occupying Australia, for, as the Malays conquered Madagascar, they could have colonized Australia. But it was not sufficiently attractive; it was too dry and dusty. But now that we have opened up the land, built railways, drilled wells, founded a lucrative trade, and secured personal safety, the Asiatics would gladly go and reap where we have sown.

Australia has only to remove the artificial barriers she has erected, to let in an Asiatic deluge. The coloured immigrants would keep clear of the still unoccupied interior. The cities and the pleasant coastal districts would be good enough for them. The difficult interior would still have to be opened up by the white man. But the figures of the Australian population would be easily multiplied.

Australia had her chance of acquiring a great coloured population. But she unhesitatingly rejected it. A rush of Chinese into Australia began in 1879, and lasted until 1887, when they had become fifteen per thousand of the population; and the stream was flowing with rapidly increasing volume. Even in Great Britain, protected by our dense established population, we defended ourselves by last year's Aliens Bill against the immigration of our civilized European neighbours. Australia, with her young settlements and her exposed position, needs to be incomparably more cautious. It stopped the immigration as soon as it threatened to come in a volume greater than could be safely mastered. New South Wales defended itself by a simple Chinese exclusion bill.

Some of the States, however, in deference to the wishes of the British Government, instead of excluding aliens on account of colour or race, adopted an education test, and the Commonwealth legislation has followed on the same lines. So that Australia has been denounced for

framing its mild Aliens' Immigration Act on the very lines recommended by the Home Government.

D. *The Possibility of a White Australia.*

Australia had another chance by the introduction of Kanaka labourers into the tropical plantations; but, resolute in her policy of a "White Australia," that system has been stopped, and after December 31, 1906, the last Kanaka labourers will be returned from Australia to their South Sea islands. This anti-Kanaka legislation has been severely condemned, on the ground that the "White Australian" policy inevitably condemns the tropical regions of northern Australia to lie permanently waste. We often hear that white men cannot work in the tropics, and that northern Australia, including many of the most fertile and best-watered regions of the continent, must either be left unoccupied or be developed by coloured labour. But is this idea more than a popular prejudice, due to the high mortality of the tropics in times when tropical diseases were not understood? Is there any physical reason why white men should not work in the tropics? Is it the heat? Attendants in Turkish baths, stokers in steamers, glass-blowers, and furnace-men in metallurgical works, withstand higher temperatures than are encountered in any tropical country. But it may be said that these men are not engaged in the open air, exposed to the fatal fury of the sun. British troops, however, have to march in India, and it is found that they are healthier then, than when cooped up in barracks. British tea-planters in India have been instanced as a healthy race, although their duties require them to be out in the hottest time of the day, in the hottest season of the year.

Not only is there nothing in the heat of the tropics to prevent white men working there, but, according to the high authority of Sir Joseph Fayrer, European children may be reared in India almost as well as in Europe. According to Sambon, the infant mortality of European children in Calcutta is 58 per 1000. According to Mulhall,* in the years 1876–80, it was 145 per 1000 in England, 163 per 1000 in France, and 302 per 1000 in Wurtemburg. In Lancaster in 1904 it was 274 per 1000.

The old high death-rate of the tropics has been greatly reduced by improved sanitation and modern knowledge of tropical diseases. Barbados once had a bad reputation for unhealthiness, but it is now, according to the health statistics of its garrison, healthier than stations in the British Islands.

The old dread of the tropics is passing away. Algeria was once regarded as intensely unhealthy. Sambon, in a remarkable paper on Acclimatization, which he read before this Society in 1896, quotes General Duvivier, "That the cemeteries are the only colonies always growing in Algeria." But with care the death-rate has steadily declined. According to Mulhall,† the death-rate of the French in Algeria

* Mulhall, 'Dictionary of Statistics,' p. 177. † *Ibid.*, p. 189.

from 1853 to 1856 was 46·3 per 1000, and it had been reduced in the years from 1873 to 1876 to 26·8 per 1000. And Algeria is now a popular European health resort.

Of course, where work has to be done under such rough conditions that life must be freely sacrificed, as when, in railway construction, a man has to be buried under every sleeper, as was said about the Panama railway, he must be a coloured man. But under conditions when ordinary economy of life can be preserved, there seems to be no physical reason why white men should not, in time, work in the tropics. No doubt we prefer a temperate to a tropical climate. But in the tropics nature is more generous; she returns a more valuable harvest, and thus compensates man for the discomforts and for the unquestionable reduction in personal efficiency. There seems to me no adequate reason why Australia should not all in time be occupied by white races; but it must be admitted that the White Australia policy involves delay in the development of some districts; for the experiment of the white occupation of the tropical lands should proceed slowly, as otherwise it must be accompanied by unnecessary loss of life. There are certain industries, such as cotton-planting, that require ample, cheap labour for the short picking season, and it may be impossible to start them on profitable lines at present. And Australia has to decide whether it is better to postpone the growth of such industries, or to risk the evils of coloured labour.

E. *Kanakas and the Queensland Sugar Industry.*

If there be one state in Australia that should have suffered by the "White Australia" policy it should be Queensland.

The following table compiled from the returns in the "Statistical

	Queensland.		New South Wales.	
	Area under sugar-cane.	Production of sugar.	Area under sugar-cane.	Production of sugar.
	Acres.	Cwts.	Acres.	Cwts.
1890	50,922	1,378,480	20,446	380,320
1891	50,948	1,024,380	22,262	530,660
1892	55,520	1,227,360	26,751	485,780
1893	59,251	1,522,920	28,112	478,605
1894	71,818	1,834,240	32,909	452,756
1895	77,247	1,725,100	32,927	444,261
1896	83,093	2,015,480	31,053	571,140
1897	98,641	1,958,320	25,865	553,066
1898	111,012	3,274,680	24,759	582,198
1899	110,657	2,465,780	22,517	307,048
1900	108,535	1,851,080	22,114	398,760
1901	112,031	2,417,160	20,809	390,375
1902	85,338	1,532,520	20,301	430,884
1903	111,516	1,836,560	20,219	435,718
1904	120,317	2,953,760	21,525	400,150

Abstract" shows the acreage and yield of sugar in Queensland and in New South Wales since 1890. In New South Wales, where there

has been no interference with Kanaka labour, there has been a fall in the acreage under sugar. But in Queensland, in spite of the anti-Kanaka legislation, there has been no such fall; the drought of 1902 reduced both acreage and yield, just as it reduced the wheat yield of the Commonwealth from 38,561,619 bushels in 1901–2 to 12,378,068 bushels in 1902-3; in 1904 the Queensland acreage is the maximum on record, and the yield has only been beaten once, in 1899.*

The Queensland sugar industry, in fact, has done remarkably well, when compared with the same industry in other parts of the British Empire. Thus in British India there has been a long and fairly steady fall from 3,100,232 acres in 1891, down to 2,280,000 acres in 1904. Similarly, in the British West Indies, the exports of domestic sugar from the twelve islands of Jamaica, St. Lucia, St. Vincent, Barbados, Grenada, St. Christopher, Nevis, Montserrat, Antigua, Dominica, Trinidad, and Tobago having fallen from 3,903,980 cwt. in 1890, to 2,358,325 cwt. in 1903 and 2,892,106 cwt. in 1904.

The people of Queensland are apparently satisfied with the change, for they have continued to return a large majority committed to the White Australia policy. It should be remembered that the Kanaka labour was stopped by the Federal Parliament, on the insistence of a majority of the Queensland members.

F. *The Labour Legislation.*

For its persistent support to the principle, that the main policy of Australia is the maintenance of the purity of its race, Australia is deeply indebted to its labour party. I went out to Australia with the natural prejudice of a British Conservative against the labour party. I understood that the advanced labour legislation was ruining Australian industries by its selfish and short-sighted policy; but after five years in Australia, during which I had the honour of the acquaintance of politicians of all sections of political opinion, I learnt to realize how much that party is misjudged. The industrial legislation is intensely democratic, but it is not wildly socialistic. We hear of the socialistic experiments, but not of points where Australia is conservative and has lagged behind ourselves. Its State railways were forced on it by geographical necessities. They had to be made quickly in order to open the mining fields, and they have had to be extended to develop territory, which will not pay for railway accommodation for years to come. The states have had to spend money on railways and country schools as a part of their land-settlement policy, and content to look for returns a generation ahead. No commercial company could be expected to build railways where it pays

* Kanaka labour continues in Queensland till the end of the present year, but the statistics show that the industry has not been killed by the imminent deportation of all the coloured labourers.

Australia to have built them. An Australian government will support a school for the family of two or three settlers, at a cost per child which seems wildly extravagant, because it knows that the best type of people will not settle in the back country unless they can get a fair education for their children. In most departments of State work the government is not especially socialistic. Where Australian legislation is more advanced than our own, is where the simpler conditions of Australia render it possible to do by law, what in Great Britain must be left to more elastic agreements between unions of employers and trades unions.

The fact that Australian industrial legislation is in some respects behind our own shows that the labour party has used its political power with moderation. Much of its energy has been devoted to legislation to secure the well-being of the Australian people, even at the cost of some unpopularity among its own supporters. The advanced temperance legislation was mainly carried by its insistence. At least in Victoria, to speak of the State I know best, educationalists find that proposals for the improvement of teaching in the State schools, for increased opportunities for technical and University education, and for the provisions of facilities for research and culture by libraries, museums, and picture-galleries find some of their warmest allies in the labour party.

G. *National Defence.*

Perhaps nothing has led the Australian democrats into greater disfavour than their views on military and naval defence. But the policy of training every man to the use of arms by military drill at school, the encouragement of cadet corps and rifle clubs, which has been recently recommended for this country by Lord Roberts, is the very system which the Australian liberal party has strenuously urged, and which Australia has for years endeavoured to adopt. In New Zealand, for example, it is laid down by the regulations of the Education Department (1904, p. 7) "that military drill must be taken by boys in every school in which there are twenty or more boys of twelve years or upwards, as provided in the regulations for public school cadet corps."

H. *Labour Costs in Australia.*

Successful manufacturing requires economic labour, and as Australia is a land of high wages and short shifts, it is not surprising that the view is sometimes held that it cannot compete against Europe with its low wages and long hours. We hear glowing descriptions of how rich Australia might be if she would only employ cheap coloured labour, which works with enthusiasm for one shilling or two a day under any conditions. The Australian workman will not accept these terms. He demands good wages, short hours, healthy conditions of work, reasonable

precautions for safety, and sympathetic treatment. If the miner gets them, then he does his best to give his employer what, to use his own phrase, he calls a "fair thing." While mine-surveying in Australia, I had excellent opportunities of observing the miners at their work. I could hear the regular blows of their hammers, kept up steadily throughout their shift. The men insist upon a full length of time for their meals, but there is very little loitering when the foreman is away, and hustling in his presence. To see what the Australian miner regards as a "fair thing," let us look at a few figures. Take, *e.g.*, coal-mining, as in it the conditions are more uniform than with gold-mining, and the results can be more easily compared, field with field. The following table, quoted from Coghlan (*op. cit.*, p. 946), shows the output

AVERAGE COAL OUTPUT, 1893–1903.

	Tons raised per annum per miner.	Average value at pit's mouth.
		s. *d.*
Austria*	605*	6 3
New South Wales ...	565	6 5
United States	536	5 6
Germany	317	7 3
Great Britain	272	10 1
France	203	11 9
Belgium	174	13 5

in tons per miner per year, and the value, at which coal is produced at the pit's mouth. The Australian miner, during the ten years 1893–1904, turned out 565 tons per miner, at the cost of 6*s.* 5*d.* per ton, against 272 tons at 10*s.* 1*d.* per ton in Great Britain. The Australian miner produces more tons of coal per year than any other miner of black coal in the world, for the Austrian figures include brown coals, and so do not enter into the comparison.† The Australian miner in his eight hours' shift raises more than twice as much as the English miner in his ten hours' shift. The British miner has thinner seams; but even allowing for this difference, it is obvious from the above table that Australian coal-mining has not yet been ruined by its labour.

In gold-mining, the best standard is quartz-mining in Victoria. The following show the grade of Victorian gold from all the gold quartz mines of Victoria for the year 1903 :—

Gippsland	15·3 dwt.
Beechworth	11·5 „
Maryborough	9·4 „
Castlemaine	9·3 „
Bendigo	9·1 „
Ararat and Stawell	7·0 „
Ballarat	6·9 „

* Includes Cretaceous lignite.

† The output from Great Britain for 1904 was 279 tons per miner, at the price of 7*s.* 2½*d.* per ton, and in Germany 248 tons at the price of 8*s.* 6¾*d.* per ton.

If we take individual mining-fields in Victoria, the last report of the Mines Department of that State states that in the gold-fields of Ararat and Stawell the ore grade for the previous year was only 23*s.* 0½*d.*, and of Ballarat only 22*s.* 0½*d.*

The average yield of the gold ores of the whole of Victoria for the ten years 1894–1903 is shown in the following table; the ore value is calculated at 3*s.* 3½*d.* per dwt., which is the average for Victoria:—

	Average yield of ore * in dwts.	Average value. s.	d.
1894	8·3	27	4
1895	8·4	27	8
1896	9·7	31	11
1897	8·9	29	0
1898	9·1	29	11½
1899	9·5	31	3½
1900	8·8	29	0
1901	8·6	28	4
1902	9·0	29	7½
1903	9·0	29	7½
Average ...	8·93	29	4½

In Western Australia we learn the same lesson, although its mining has especial difficulties with its refractory ores, scarcity of fuel, and scanty water. At Kalgoorlie, all the water required by the mines has to be pumped from an artificial reservoir 350 miles distant, and 1245 feet lower.

The *Government Gazette* of December 15, 1905, gives the records for the previous October. The grade of the ore, comparing whole fields, ranges from 145·84*s.* per ton for the small yield from the remote mines of West Pilbarra, and 62·19*s.* from the 117,268 tons treated during the month in East Coolgardie. But the ore values fall in the lower-grade fields to—

Coolgardie	35·64*s.* per ton
Mount Margaret	28·31*s.* „
Lawlers	27·60*s.* „
Yilgarn	25·62*s.* „
Niagara	25·09*s.* „
Peak Hill	15·50*s.* „

Individual mines work still lower-grade ores; and the same number of the *Westralian Mining Statistics*† mentions, among small mines—

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* 'Ann. Rep. Secretary for Mines for the year 1903. Victoria.' Melbourne, 1904, p. 16.

† "Mining Statistics, Western Australian Goldfields." Supplement to *Government Gazette*, No. 74, December 15, 1905.

Star of Freemantle	10	stamps	yield	6·83s.	per ton.
Transvaal, Greenmount	20	„	„	7·91s.	„
Phillips river	10	„	„	13·0s.	„
Queens Cross Leases, Coolgardie ...	10	„	„	7·0s.	„

Railway construction shows the same lessons. The cost of the first Australian railways was enormous, and adds heavily to the average cost of the lines; but the following, recent Victorian lines, on the wide gauge of 5 feet 3 inches, have been built at the cost of as low as £1420 to £2185 per mile,* although made by white labour through arid country, mostly covered with thick scrub.

	Length.	Average cost per mile.
	Miles.	£
Woomelang to Mildura	110·15	2185
Birchip to Woomelang	26·45	1420
Wycheproof to Sea Lake	47·89	1485
Quambatook to Ultima	30·31	1501
Dimboola to Jeparit	21·59	1834
Jeparit to Albacutya	18·47	1663

These remarkable economic achievements are due, not only to the skill of Australian engineers, but to the high efficiency of Australian labour; and when we see what Australia can do with white labour, we may congratulate her on the decision not to risk the introduction of coloured races. This policy may mean a slower growth, but it will probably mean the surer growth of a united, homogeneous people.

The fundamental plank in the democratic programme of Australia is the belief that a high average of character is the most important of national assets. The Australian points to the dangers in Europe from its submerged tenth, and the extremes of wealth and poverty. He urges that in America unrestrained individualism is leading to the same evils, and tends to engender a spirit of national selfishness. So he believes that Australia will be the happier and better in the end, if the country be so governed, as to secure a high average of comfort and character, rather than a few millionaires and a multitude of paupers. Here, say the Australian liberals, we have a continent with immense industrial resources, with a fine climate, a rich soil, and capable of producing food, clothing, and all things necessary for a great population. The vast trackless forests, the wastes of uncleared scrub, the low-grade ores, and the rich coalfields, are sources of wealth, from which every man willing to do an honest day's work should be able, for generations to come, to earn a fair day's wage. So they claim that it is the highest duty of Australian statesmen to develop a people, who will carry on the civilizing mission of our race in a manner worthy of

* 'Victorian Railways. Report of the Victorian Railways Commissioners for the Financial Year ending June 30, 1904.' Parl. Pap., Victoria, 1904, No. 32, pp. 30–31.

their unique opportunity. So they insist that every child must have a sound and stimulating education, and every town a good free library, and men must be employed under conditions which rouse an intelligent interest in their occupation, and leave ample time for rest and recreation.

I have tried briefly to indicate the motives that have inspired Australia, for the widespread misunderstanding of her policy seems to me deplorable, and to have, perhaps, possibilities of future trouble. For the typical Australian has not much formal religion. His real religion is his patriotic devotion to the empire; and it should be remembered that his loyalty is not only to the British Isles, but it is even more strongly, loyalty to the British spirit. Australia recognizes that the success of the British Empire has been due to our readiness to sacrifice immediate returns to ultimate benefit, and our comfort to our conscience. In an impulse of disinterested philanthropy, we squandered millions in the emancipation of the slaves of our empire. We burdened ourselves with a huge national debt in the struggle to save Europe from French militarism. We have built up our empire by the ungrudging sacrifice of our best blood and the expenditure of unstinted treasure. Australia believes that her choice of the harder of the two paths open to her, rather than risk ultimate injury to character, is in accordance with British traditions. The most serious chance of disagreement between Britain and Australia is that of our drifting into positions in which we appear to the Australians to have forfeited their allegiance by disloyalty to the national faith. Nothing else seems to me likely to wither the tie that binds us; for Australian attachment to the Empire is a deep-rooted, intimate sentiment. It brought her loyal to our side on the field of battle, where her efficient help stirred our national pride; and we may feel even prouder of her high economic triumphs, as they have been gained loyal to the noblest traditions of our race.

Before the reading of the paper, the PRESIDENT said: The author of 'The Great Rift Valley' needs no introduction to any audience in this country, and, indeed, Prof. Gregory's reputation as one of our most brilliant as well as one of our most active geographers and geologists has spread far beyond these islands. But I think it may be interesting if I recall to you a few of the leading points in his scientific career, and especially those where he has come into touch with our Royal Geographical Society. I shall not dwell upon his early travels for geological purposes in the Rocky mountains and elsewhere, but I will remind you that about twelve years ago he gave us here a most important contribution to our knowledge of the physical geography of British East Africa, based upon his notable journey to Mount Kenya and Lake Baringo, an expedition the more notable on account of the very slender resources with which Prof. Gregory carried it out. Not long after, he went as naturalist with the expedition which Sir Martin Conway took to Spitsbergen, and shortly after his return he read us a highly scientific paper on the plan of the Earth and its causes. We had hoped that Prof. Gregory might have been

able to accompany our National Antarctic Expedition as the director of the civilian scientific staff, and it is no derogation from the merits of the geologist who actually went with that expedition if I say that the loss of Prof. Gregory's experience and insight could not be made good. Instead of going to the Antarctic with that expedition, Prof. Gregory accepted the Chair of Geology in the University of Melbourne, and, subsequently, the directorship of the Geological Survey of Victoria. He made one notable expedition to Lake Eyre, where he gathered materials upon which he has based some interesting conclusions as to the past history of the island continent. But during his residence in Australia he did not confine himself solely to geology; he paid a great deal of attention to the economic conditions of that country, and we may be sure that whatever a man of his calibre and his experience may have to say about the economic development of Australia will deserve our closest attention, and also full discussion after his paper, which I now invite him to read.

After the paper, the PRESIDENT: We are so fortunate as to have here to-night Sir John Forrest. I need hardly say that his name is well known to everybody who cares about the British Empire. Every one knows him by reputation as having been, after official employment of various kinds, the first Prime Minister of Western Australia when she became a self-governing colony. Every one knows he held that position until the Commonwealth was formed, and resigned it only to take office in the Commonwealth ministry, which he still holds. I believe he has held high official position for twenty-three years, with only a break of one year. But while all imperialists know Sir John Forrest by reputation in these capacities, there is another person even more interesting to us as geographers, and that is the youthful John Forrest of thirty to forty years ago. His is one of a small galaxy of names of men who broke through from the seaboard into the interior. There was his expedition in the search after Dr. Leichardt which, like the search after Dr. Livingstone, led to remarkable results. Then came his arduous journey from Perth to Adelaide round the great bight of Australia. Later on came his last and most daring expedition into the very heart of the continent. As the minister of to-day and the explorer of old, we shall be glad to hear anything that he may tell us about Australia.

Sir JOHN FORREST: I am afraid you have given me a somewhat difficult task in that you desire that I should tell you about my experience in days now long ago, and also that I should say a few words in regard to the address which we have been so fortunate as to listen to. I can only assure you that I am very glad indeed to be here in this hall again. I think it is thirty years since I was here, and I remember I gave an account to the meeting at that time of my last journey through Western Australia from Champion bay on the west coast to the overland telegraph line, which I struck about 700 miles north of Adelaide. Since that time many other explorers have crossed from east to west or from west to east; but no other explorer, either before or since, has done what I was fortunate enough to be able to do—that is, cross with horses only. Since that time camels have been introduced into the work of Australian exploration; and when I tell you that a horse wants water every day, at least, and a camel can go, under exceptional circumstances, nearly a month without water, you can well understand how much more difficult it was for us, in '69, '70, and '74, to penetrate into the interior of Australia than it has been for those who have followed in our footsteps. I have listened with very much pleasure to the lecture which we have heard from our friend Prof. Gregory, which he has divided into two parts. First of all, he told us a great deal about the physical conditions of Australia, and then he finished his address with matter that would have served well

a politician. I must thank him for saying so many friendly words about Australia and about the intentions and desires of the Australian people. In regard to the matter of white Australia, I have never gone so far as to say that I should leave all the northern part of Australia unoccupied and waste (some people go that far) rather than have it developed by the employment of coloured labour. I have never gone that far, but I say this—that if white men can do the work, I shall do all in my power to encourage them to do it, and instead of their being any feeling in this country against Australia for desiring to keep that continent a white man's country, I think you should all rejoice. You should all rejoice that we are trying to build up in the southern hemisphere another place where our countrymen, the people of the United Kingdom here, may go and live and flourish, another England, another permanent home for our race in the southern hemisphere. When I visited, a few weeks ago, a portion of Syria—Jerusalem, the cradle of our faith—and I saw the result of nearly two thousand years of the civilization of a coloured race; when I saw an absolute absence of anything like comfort as we know of it; when I saw those people living under conditions which I hope will never prevail in Australia, then I thought to myself, I do rejoice, and I am sure the people of the mother-country ought to rejoice, that we are making an effort to preserve that continent of Australia for them. It is sometimes said that we in Australia are selfish, and that we are trying to keep the place all to ourselves. Well, I don't think that is so. We desire to see the place filled up with good sterling white British people. Even with the small number of four millions British people, we are doing a great work who are there already. We have an external trade—three-quarters of it with the British people—of £100,000,000 sterling a year, and we have a production from the soil, including the manufactures (which amount to £29,000,000 sterling a year, and are increasing) of £120,000,000 a year. Can you show me any other place in the world where so much is done, where such great figures can be shown for so small a number of people? There is no other place in the world where four millions of men, women, and children produce £120,000,000 of primary productions. And I am sure there is no other place in the world where four million people, including men, women, and children, have an external trade of £100,000,000 sterling a year. Well, I think that there is no reason to complain that we are not going ahead; every year we are progressing. At the present time, we are more prosperous than we ever were since Australia was founded, and if we have a few more good seasons—because a great deal depends upon the annual rainfall—well, then, perhaps we shall get "too big altogether for our boots." I do not know that I need say anything more; I did not come here with the intention of speaking, I came here with the intention of listening, and I have listened very attentively to the paper with the greatest pleasure, not the least interesting portions being those which might have been expected from one of the leading politicians of Australia rather than a learned Professor of Geology. It only shows you that Prof. Gregory has not been in Australia without keeping his eyes open, bringing his keen judgment and knowledge to bear, not only on our geology, but also on our social conditions. I am delighted to be here to-night, and to renew my acquaintance, after so many years, with the Royal Geographical Society. I was very closely connected with it in my youth, and I have every reason to be proud of the Geographical Society, because they were good enough to give me the greatest honour that they have the privilege of bestowing some thirty years ago. I have had a varied career, as my friend the President has told you. I have been fortunate enough, he says, to have been in office—I think he said for twenty-two years out of twenty-three. Well, that is a very long time indeed; but I will say this to you here to-night—that although

many successes have been agreeable, and have given me, when I look back upon them, very much satisfaction, I am prouder of being a Gold Medalist of the Royal Geographical Society of London than I am of any other honour that I have ever received.

Sir Horace Tozer (Agent-General for Queensland): I am afraid I can only say a few words. The paper divides itself into two subjects, and one of those is intensely interesting to all Australians like myself, and it will be read with interest there, and will place on record many facts not hitherto understood. I certainly was delighted with it. In regard to the second part, I am precluded by my office from ever alluding to controversial politics in England; I cannot, therefore, say anything about them whatever. I am sorry to think that the professor was not able to visit the north-eastern parts of Australia—Mount Morgan, in the north particularly. I am perfectly sure he would have been able to give us a most interesting geological description of Mount Morgan. You cheered when you saw a picture of a mine, and knew that it only had a capital of £15,000 and returned £1,500,000 in dividends. Mount Morgan had not a single farthing capital, and has returned something like £7,500,000 in dividends. If he had gone there, it would have stimulated others to seek for discoveries of a similar character. I am very proud of the land of my birth, and I can only say that if Great Britain maintains the position she has established for all her colonies, of not interfering with them, they will remain as they have always been—the bonds of empire.

Mr. T. A. Coghlan (Agent-General for New South Wales): We have been so long accustomed to have thrown at us opinions so entirely different from those voiced by Prof. Gregory, and so completely unfavourable to Australian ideas and aspirations, that to hear the learned professor's views concerning our country is like inhaling a breath of fresh air in a close room. My object in addressing you is to support the professor's views on the economic aspect of Australian settlement, and to point out how Australia occupies a position essentially different from any other portion of the empire, or, indeed, any other country peopled by a white race. It stands out of the course of the great trade routes of the world, remote from Europe, from which it is removed thirty days' steaming. On the other hand, it is close to the teeming shores of Asia, being seven days from India, ten days from China, and eleven days from Japan, and along its northern coasts lie the great East Indian archipelagoes. The peculiarity of its isolated position makes the pressing problems Australia has to face in the development of settlement unique of their kind, and there can be scarcely any question that upon the right solution of these problems will depend its ultimate position among the people of the world. Other countries have been able, from analogies to be found in history, to gain some light on the perplexities of their progress; but this is denied to Australia, where the problems of its civilization must needs be approached one by one and solved experimentally. Australia, as it has been frequently said, is the outpost of white civilization in the East. It has no native difficulty such as that of South Africa, and its troubles in the matter of coloured population arise from its proximity to India and China, the Japanese element of the case being of a negligible quantity. What Australia sees very clearly is, that if it admits the Asiatic population freely, it will be speedily face to face with a difficulty at once economic, political, and ethical. Australia is so close to South-Eastern Asia that with unrestricted immigration it might easily find itself with a large Asiatic population out of all sympathy with Australian ideals, aliens in manners and religion, in sympathy and aspirations, with whom inter-marriage would be impossible, or, if possible, most harmful—a population to be defended in case of aggression, and useless and untrustworthy for the purposes of general defence. Apart from the question of morals, the chief

Australian objection to the Chinese is economical. He is a producer, and not a consumer. If the price of labour be determined by the cost of its maintenance or production, then the European, with his need for varied food, superior clothing, sanitary surroundings, comfortable lodgings and amusements, and like conditions for his wife and family, requires a much larger wage than does the Chinese worker, and in competition must go to the wall—a fate he is not likely to accept in Australia without a desperate struggle. The Australian has won from the wilderness comparative comfort and contentment, conditions which would be jeopardized to all except the wealthy by the indiscriminate introduction of the Chinese. The country most favoured by the partisans of black labour is the northern territory, where there is much fine land, and tropical produce grows in great profusion. But who would gain by its employment in the development of this territory? The bulk of the white population would certainly not be beneficially affected; but over and above all this, Australians argue that it has not yet been demonstrated that white men cannot work in the Australian tropics. The experience of other countries does not determine the question. What is true of Africa and America is not necessarily true of Australia, where it is found that occupation vastly improves the coast lands, from the point of view of health, malarial fevers retreating before the face of systematic cultivation. As regards work in the open, in what respect is the Chinese or Japanese more fitted by upbringing for work in a warm climate than is the native-born Australian? Taken as a whole, the climate of Japan is a cold one. At Hakodate the temperature of the coldest month averages 28°·3 Fahr., and at Tokio 36°·3 Fahr.; while the temperature of the hottest month is in one case 71°, and in the other 79°·9. Similarly in China, at Shanghai, in the centre of the coast, the average of the coldest month is 25°·7, and of summer 82°·6; while at Pekin the temperatures are 26°·6 and 79° respectively. Compare these temperatures with those of Sydney, where the average of the coldest month is 52°·3, and of the hottest 71°·5; or of Melbourne, where the average temperature of the coldest month is 47°·6, and of the hottest 66°·3. In any case, what is the urgency of the matter? Australia has the centuries before it. If its people now make the error of introducing Asiatics, the blunder will be fatal and irreparable, whereas the course of finding out by experiment what the white man can do in the tropics is obviously the one dictated by sanity and safety. The second point to which I should have wished to make reference is the oft-repeated statement that Australia is given over to socialism and all things socialistic, but to do so adequately I should have to pass beyond the limits of even economical geography. May I say that there is in Australia much more excuse for socialism than in this or in any other old country. In the early days of settlement in Australia, the Crown delegated to the governor such powers as made him the father and ruler of the state. Yet there was no talk of socialism in those days. The governor was not only the commandant of the settlement, but was patriarch and bread-provider of the struggling colony. He was dictator, chief justice, court of appeal, parliament, store-keeper, and census-taker. He journeyed from district to district of his little realm, questioned his people, admonished them as to their conduct, and carried back with him to headquarters the list of their grievances. He built their roads, their schools, their churches, their markets, regulated the price of their produce, distributed rations, and altogether his relations with his people were immediate and very personal. The conditions of Australia made Government intervention an absolute necessity, and the physical peculiarities of the country made settlement impossible except with the continued assistance of the Government. There are in Australia no large navigable rivers to convey merchandize to the interior, and railways were an original and urgent necessity of progress. Private

enterprise was allowed to make an attempt to supply this want, but it failed disastrously; and if the country had waited for private enterprise for its development, it would still be without any proper means of communication. The principle of action adopted by the Australian states is that where any service is in the nature of a monopoly, it is best undertaken by the state or municipality. But even this very excellent doctrine is not by any means pushed to its logical conclusion. The adoption of the principle of state ownership of railways and of the great monopolies—water supply, sewerage, telegraphs, telephones, etc.—involved the creation of a public debt, inasmuch as no state is in a position—Great Britain any more than Australia—to undertake railway extension on a large scale out of ordinary revenue. Compared with the United Kingdom, Australia is very lightly burdened, the unproductive state and municipal or local debt being in each case—United Kingdom, £990,000,000, equal to £23 6s. per inhabitant; Australia, £45,000,000, equal to £11 9s. per inhabitant. In reality, therefore, the debt of Australia is proportionately much less than that of the United Kingdom, maugre all that is said to the contrary. Taking all forms of taxation on real property in Australia, it will be found that the total for the Commonwealth amounts to £3,833,579 on a capital value of £683,944,000, equivalent to 11s. 2*d*. per cent.; and as the net return from property in Auustralia is at least 5½ per cent., the burthen of taxation on property is equal to 2s. 1½*d*. in the £ of rental value. For this sum, the services of water and sewerage are included; excluding these services, the rate would not average more than 1s. 7*d*. in the £, the highest rated area in Australia not having, I believe, a greater burthen than 2s. 6*d*. It may be safely affirmed that the highest rate of district taxation ever proposed to any Australian Parliament does not reach to half the minimum now imposed in the most favoured districts in England. The aim and end of all land legislation in Australia, including that of land taxes, has been the settlement of the industrial population on the soil and the prevention of the accumulation of large estates. It is notorious that in many respects this legislation has not been successful, and the accumulation of large estates has gone on, and will continue to go on, so long as the holding of land in large areas is found to be profitable. In dealing with the question of the settlement of population on the land, Australia has had to solve its difficulties by experiments, and the various experiments which have been tried have all had the family resemblance of failing more or less in the object which they sought to attain. There has been the policy of granting land without payment; the sale of land in living areas to persons willing to develop such land; sales by auction; free selection after survey; free selection before survey; indiscriminate sales by auction; and leasing in one form or another,—all these methods have been but so many roads to the establishment of large estates, and all the Australian Governments have been forced to the conclusion that it is necessary, in order that the development of settlement shall not be further impeded, that the large estates shall be bought back from their owners and cut up for closer settlement. It would, of course, be contrary to our knowledge of human nature to expect that even this policy of cutting up estates will cure the greed for land that is everywhere a passion, and not less in Australia than elsewhere; but whether successful or not, there is a strong sentiment in Australia that the land question is the key to the solution of many social difficulties, and if such question were solved satisfactorily, much would be done to prevent the formation of an hereditary pauper class, which is so depressing a spectacle in this as in all other countries. This idea has been at the root of much of the recent land legislation of the Australian states as well as the determination of Australian statesmen to maintain the policy of a white Australia, and assure to the working classes a reasonable living wage. It is also

the idea which is behind recent legislation in regard to friendly societies and savings-banks for those who are able to save, and old-age pensions for those whose lot in life and whose misfortunes have prevented them acquiring a competence sufficient to give some sort of ease to their declining years.

I may say it has afforded me the very greatest pleasure to listen to Prof. Gregory, and I am quite satisfied that his paper, whether it is appreciated in this country or not, will find in Australia the very warmest acceptance. He is most accurate, so far as I know, in all his facts, and the picture he draws of Australia is one which I very much welcome. I believe what he has said will do an enormous amount of good, because he comes to Australia as an unprejudiced spectator, with just the knowledge which well-informed men have. He studied our customs, he studied our occupations, and brought back with him a most favourable impression, and an impression which is most gratifying to us who are natives of that great continent.

The Hon. J. Greeley Jenkins (Agent-General, South Australia): I should be violating one of Australia's social laws were I to speak—the eight hours' principle. I do not wish to do that. However, for just a moment, I will take the opportunity of thanking the professor for the interesting paper that we have listened to to-night, and I would like to take the opportunity, also, of pointing to my friends, Sir John Forrest and Sir Horace Tozer, as two examples that Australian climate does not kill white men. Sir John passed from the dryest part through the hottest part of Australia. That was thirty years ago. Look at him now! If you have in this beautiful climate of England any brighter or more healthy specimen, in the language of the Americans I might say, "Trot him out." I am not going to dwell on anything in relation to foreign labour—that has been discussed in this country; but there was one remark made, either by the lecturer or one of the speakers, that, coming from Australia, I strongly emphasize; that is, we ought to have a fairly good idea of what we want for ourselves. All we ask is that we shall have the privilege of making our own laws.

The President: I feel sure that you will all join in a most hearty vote of thanks to Prof. Gregory for the admirable geographical paper he has given us, and also for the political additions to it, and that you will include in that vote of thanks Sir John Forrest and others who have given us so interesting a discussion upon Prof. Gregory's paper.

Prof. Gregory: I would like just to thank you very heartily for your kind vote of thanks, and especially for the kind remarks made by the President, Sir John Forrest, and the Agents-General. I am sure if my paper has had no other results than that of producing the valuable statistics of Mr. Coghlan, the trouble will be thoroughly repaid. I might remark that I think the final part of my paper was not so much political as economic. If it is not economic geography, I do not know what economic geography means. Unless one considers labour questions, it is impossible to estimate the value that can be made of the raw materials.

SOUTHERN PERU: NOTES ON TWO EXPEDITIONS.

By C. REGINALD ENOCK, F.R.G.S.

I. Regions of Sandia and Carabaya, and Lake Titicaca.

Early in August, 1904, I left Lima with the object of examining some ancient gold-mines in the interior of Peru, beyond the Andes, upon the headwaters of the river Inambari. The river is an affluent of the

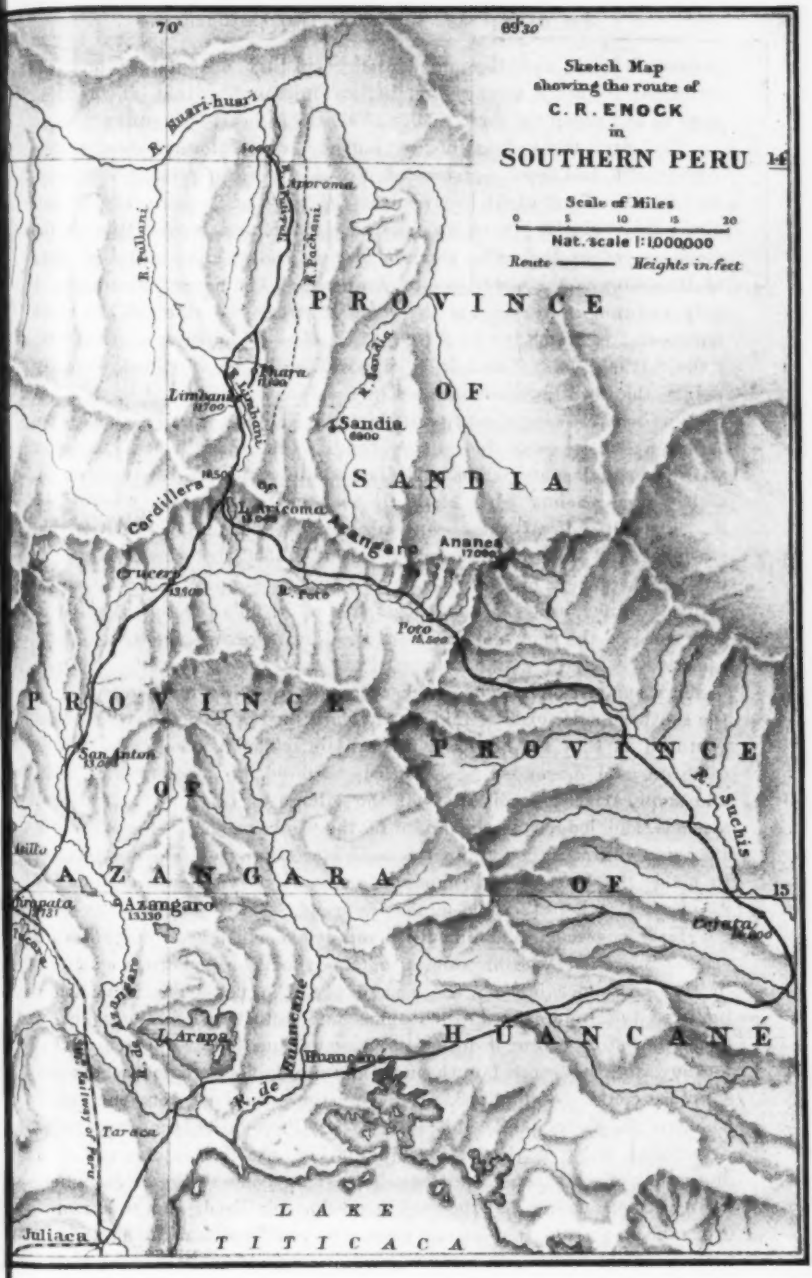
great Madre de Dios river, which forms part of the fluvial system draining the western portion of the watershed of the Amazonian basin, and which, rising in the Andes near the boundary of Peru with Bolivia, unites with the river Beni, and under the name of the river Madeira falls into the Amazon.

Three days' steaming from Callao brought me to the port of Mollendo, whence the southern railway of Peru, *viâ* Arequipa, took me to the station of Tirapata, a distance of 337 miles by train. The railway crosses the Andes at a height above sea-level of 14,666 feet at "Crucero Alto," and descends thence into the basin of Lake Titicaca. It then runs north-westerly to the station Sicuani, from which point con-

PEAK OF CORAPUNA.

struction work is now being carried out in order to complete the connection to the old Inca capital of Cuzco. Looking westward from the railway near the summit—Crucero Alto—a glimpse is obtained of the peak of Corapuna, of unknown height, but which, judging by its considerable ice-cap, must be of great elevation. The accompanying view is not taken from this point, however, but from much nearer the peak, on a subsequent journey.

The elevation of Tirapata, where I exchanged the train for the saddle, is 12,731 feet. It is surrounded by the vast stretches of flat land, or pampa, which extend north-westerly from the shore of Lake Titicaca along the Pucara and Azangaro rivers. Save at mid-day, when the sun shines strongly, the region is cold and bleak, and the air rarefied, due to the altitude. From the same cause cereals and alfalfa


70°
69°30'
Sketch Map
showing the route of
C. R. ENOCK
in
SOUTHERN PERU
Scale of Miles
0 5 10 15 20
Nat. scale 1:1,000,000
Route ——— Heights in feet
R. Ruari-huari
Laroma
R. Pallani
R. Pachani
PROVINCE
OF
SANDIA
Limbani
Sandia
Cordillera
Azangaro
Ananea
Crucero
R. Poto
Poto
PROVINCE
OF
AZANGARA
PROVINCE
OF
San Anton
Azangaro
R. Sachis
Cojata
L. Arapa
R. de Huancané
HUANCANÉ
Taraco
LAKE
TITICACA
Juliaca
15

do not flourish, and the chief product is that of potatoes, and the principal industry among the Indian inhabitants that of breeding alpacas and sheep for their wool, and llamas as beasts of burden.

The first three days of my journey was performed over a new road which had been constructed by an American mining company, and on the third night I arrived at the town of Crucero, 13,800 feet. From this point the road becomes very rough and broken, due to the steep ascent to the main summit of the Andes, known at that part of its course as the Cordillera of Azangaro. The name "Azangaro," I may mention in passing, is that of a town on the river of the same name, and is stated to be a corruption of a Quechua word meaning "the farthest away," and it is supposed to be the furthest westerly point—the Cordillera—dominated by the Inca *régime*.

The road crossing the summit skirts the shore of a large lake—Lake Aricoma—whose green and blue profundities reflected the peaks, covered with perpetual snow, which arise immediately upon its eastern verge, and whose glaciers give birth to the constant streams which feed it. The altitude of this beautiful lake is about 15,000 feet above sea-level, and the road ascends to about 16,500 feet shortly beyond, crossing a portion of the ice-cap. I again passed this point upon my return journey, and shall further speak of it. To the north-west are seen some of the snow-clad peaks of the Nevado de Vilcanota, a colossal range.

This summit of Aricoma marks the water-parting of the continent, the southern side forming that of the watershed of Titicaca, whilst the northern is that of the Amazonian basin. The usual Andian storm came on as I descended, and, pelted, battered, and soaked with rain and snow, arrived at nightfall at the village of Limbani, 11,700 feet altitude, and lodged at the house of the "gobernador." Here I met a Peruvian engineer, bound for the same place as myself, and we decided to make the journey in company to my objective point, known as "Aporoma," where the gold-mines are found.

Having overcome the difficulties and delays which are the invariable accompaniment of the organizing of an expedition in Peru, we set out in the early morning on the last day of August. The expedition included ten Indians, armed with machetes, etc., and carrying heavy packs consisting of our bedding, implements, and food for three weeks' journey, for the route lay through an uninhabited region where no supplies could be obtained. Nine of these Indians were the usual Cholos of the Sierra, whilst the tenth was a "Chuncho," of the—reputedly—cannibal tribe of that name, inhabiting the far interior of the Montaña. Nevertheless, the Chuncho, having come to the Sierra when comparatively young, had become somewhat civilized, and was, moreover, almost the only one among them who could speak or understand a little Spanish.

I had taken a consensus of opinion as to the route it would be necessary to traverse, and as a result decided to go on foot, a proceeding which I found to have been wise, as the trails were impossible in places for horses or mules. Our way lay at first along the river Limbani, and leaving this the trail wound up a long steep ridge to a height of 13,500 feet. The granite formation at Limbani had now changed to a slate, and gold-bearing quartz lodes are encountered in the region. Having crossed the high ridge, slowly and with frequent halts, for the rarefied air of that altitude renders walking fatiguing and the work upon the lungs severe, we descended the difficult zigzag and scarcely visible trail to a grass-covered valley below, and slept in a "tambo" upon the banks of a stream near a small Indian village known as Cutani. A "tambo" is a building which serves for the common accommodation of travellers, and a few of these huts—for they are nothing more—are maintained in one or two places in Peru by local authorities for that purpose, although unfortunately they are very scarce, notwithstanding that routes of travel often pass through uninhabited regions. Poor as was this tambo, its roof was waterproof, and there was some dry firewood inside, which ensured supper and a dry bed. For many subsequent nights these desirable adjuncts were only obtained with considerable difficulty, as, in order to sleep within a hut of any description, this had first to be constructed.

The progress of the party was, as regards actual leagues covered, relatively slow, for the Indian carriers were rather heavily laden, and my companion, moreover, was not a rapid pedestrian. I frequently found myself far in advance of the rest of the party, alone in those strange and untravelled solitudes of the Andes upon the border of the mysterious Montaña.

The descent of the eastern slope of the Andes is rapid, and the change of temperature as the traveller approaches the region of the forests very noticeable. At the end of the second day I found myself alone, following the trail along what appeared to be the back of a high sharp ridge, for the heavens were entirely obscured in a thick, warm mist, and the landscape entirely shut out from view. Looking through the bushes on either hand, it was apparent that the ground descended precipitously on both sides, and, indeed, on the right hand I could hear, as if far below, the murmur of running water. This I knew to be the river Pacchani, which rises in the Cordillera and empties in the Huarihuari, and so into the Inambari river, before mentioned.

The mist panoramas in these regions are remarkable at certain seasons, and the rains are heavy and continuous after mid-day. I sat down and waited for the rest of the party, and as soon as the Indians approached set them to work cutting boughs and building a shelter for the night on the only spot available—a small ledge of rock about 6 feet wide, with an abrupt precipice of some thousands of feet of sheer

descent into the river below, and over which our feet almost hung as we lay down to sleep upon our blankets.

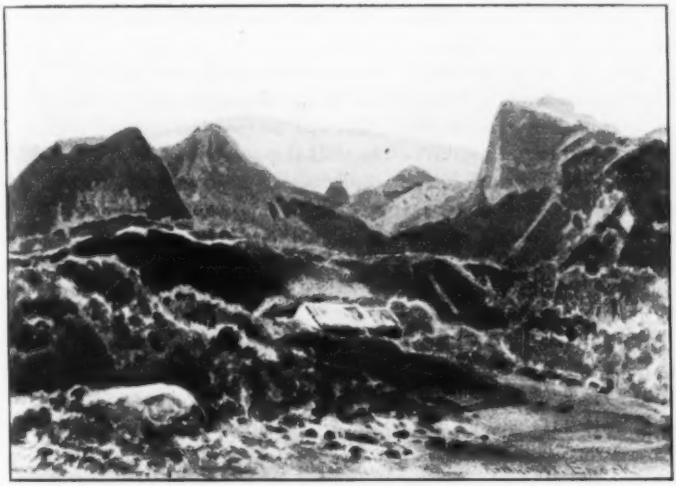
For two days more we pursued our journey, the rain pouring down upon us incessantly. The "trail," if by courtesy I may term it such, passed at times through a series of rock-basins worn in the slate, and progress was made through them as through a succession of "baths," for they were full of water from the rain. I made no pretence of keeping dry; it was impossible during the march, for, apart from the "baths" underfoot, the vegetation met overhead, and, being loaded with water, sent down its showers at every step. Impatient of the wearied Indian bearers, I carried a machete in my hand, and often was obliged to carve a way through the thick growth of the brushwood which covered the old trail, for we had now left the open slopes of the Cordillera and entered upon the upper edge of the Montaña, or region of forests.

The altitude at which this vegetation begins is from 10,000 to 11,000 feet above sea-level, and the line of demarcation is strongly noticeable. Above are the slopes and valleys of the "pajonales," or grass-covered areas, free of trees of any description, whilst below the traveller enters among thickets of tangled brushwood of all kinds, and in places of beautiful flowering shrubs. As he pursues his journey onward and downward palms and tree-ferns appear, the atmosphere becomes warmer, the mists lie heavier, and the silence is broken only by the patter and fall of the heavy water-drops from the boughs above. Scarcely a living thing appears to inhabit this upper fringe of the tropical Montaña. There are no monkeys, no snakes, no birds, and very few insects. An occasional puma is heard, and at times the swish of condorian wings in the ambient above; but nature here is in a changing phase, and her profusion of animal life seems to be reserved for the more tropical interior, still many leagues away towards the sunrise. At times the mists lifted for brief moments, and gave me glimpses of far-reaching tree-clad slopes divided by profound valleys, stretching away into the vast Amazonian basin. At a turn of the trail which brought me out upon the brow of a hill, I beheld a cascade on the opposing slope of a valley, a high white, lace-like fall among the green background of the branches, and I hailed it with satisfaction, for, from descriptions of the place, I knew it to be not far from the point of my destination. It forms the source of a small river, the Puli-puli, which runs close to the mines of Aporoma.

Difficult as the trail had been, it nevertheless bore witness to the considerable work which had at one time been carried on at these mines, for long portions of it were constructed of slabs of stone placed in the form of steps, and must have been made at considerable expense in the past centuries when the mines were worked, first by the Incas, and later by the Spaniards, for these latter did but work on a larger

scale, in many cases, what the former had previously discovered and used.

At length, after more than four days on foot from Limbani, and sleeping and eating under difficulties, we arrived at Aporoma. It was already evening; the rain was falling heavily, as usual, and there was no habitation or living being in the vicinity, notwithstanding that in bygone ages it had been the scene of the activity of thousands of workers, and that a village had existed there. But after diligent search among the vegetation, in a spot which the Indian guide, with that strongly developed faculty for locality which his kind possesses, had stated as being the site of the former house near which he had worked



OLD GOLD WASHINGS OF APOROMA.

when a boy, the walls of a habitation were discovered. Animating all hands, I directed the clearing away of the heavy growth of vegetation which cumbered them, and within a couple of hours the interior was free; a durable roof, composed of strong branches covered deep with leaves and grass, was constructed upon the walls; our beds were arranged upon a floor-covering of aromatic boughs; and a fire was kindled in one corner, so that we were able to contemplate the coming night with something of equanimity. The altitude at this point was about 7200 feet; the temperature at 8 p.m., 46° Fahr., and at 3 p.m. in the afternoon, 60° Fahr.

The mines are worthy of a brief description. They consist of a large area, between the rivers Huayna, or Puli-puli, and Pacchani, of Tertiary gravel; the bed of an ancient river, upheaved by some

eruptive action probably, and resting upon a bed-rock of clay-slate. As previously stated, they were worked many years ago as open placer mines. Conduits and sluices were constructed of stone, and tunnels through the gravel banks, and various other works, which in some ancient records are stated to have cost a sum equal to more than half a million pounds. Vast quantities of gold were extracted, and the old workings, very extensive, attest the activity which was displayed. A "grant" of six thousand Indians was "spent," it is stated, upon this work by a Spanish viceroy, and much of the gold extracted went to Spain. The "grant" of Indians principally left its bones in the vicinity of its toil; decimation of the population came about by rebellion, greed, and avarice, abandonment followed, and nature presently covered up the scarred evidences of man's transitory handiwork with her generous bores of flower and foliage.

I penetrated some leagues further into the Montaña, following the course of the river, and descended to an elevation of 5000 feet. The temperature here was much higher, due to the descent, and registered in the evening 69° Fahr. The hill-slopes and valleys are thickly covered with trees of comparatively small girth and height, and the existence of a few cedars marked the beginning of the region where these flourish. The country is exceedingly broken and difficult of access here, and the rivers are torrential and rapid. The geological formation is a slate, heavily charged with iron pyrites, and containing quartz.

Returning to Aporoma to finish my study of the mines, I was confronted with a strike of the Indians. The cause of this was the lack of provisions, which had given out. To gain a couple of days, we despatched those among them who were not absolutely necessary, and supplied the remainder with food from our own slim remaining stores. But at length I had to give the order to depart, for there remained nothing but rice and tea, and on this we were obliged to subsist for five days, under forced marches, in order to get out of the Montaña and return to Limbani.

The traveller has continually to observe the truth that misfortunes never come singly; and on the second day one of the Indian bearers, the Chuncho, disappeared, and left his baggage in the trail. As the other bearers were already overloaded, it was impossible to distribute his bundle among them, and, ordering a halt, I was obliged to have a selection made of articles which could be dispensed with most easily. I abandoned my travelling-cot and various articles of clothing, and my companion some of his instruments, whilst we reduced the number of our cooking-utensils to the lowest possible limit. The Chuncho we never saw again, and the Indians considered that he had gone to rejoin his tribe. As a tribute to aboriginal honesty, I may state that he took nothing away but his own things, notwithstanding that among the

articles he carried were my saddle-bags, containing a sack of Peruvian and Bolivian silver dollars!

At the end of the third day our meagre rations of rice and tea were concluded, and we formed camp early, with the intention of making a long march on the morrow to the town of Phara, which was rather nearer than Limbani. A rude roof of branches was constructed, but, fortunately, the rain had held off during the return journey. The sky had been clear, but as evening fell the mists arose and formed one of those curious and weird transformation scenes such as the traveller in the Andes may witness. I find in my note-book the following description, written upon the spot:—

"The sun has set, but it still tinges the western sky with its beautiful and indescribable tints. The palest saffron fades into the pearly green of the zenith, and the last and orange rays, calm and cold, flash faintly and expiringly upwards. In and among the deep cañons of the stern and purple-green hills below, the fleecy cloud-masses of pearly vapour slowly pour, filling them with impalpable lakes, so soft, so pure, they seem the essence of the elements, spread for the couch of some unseen god-traveller. Below, wrapped in the shades of darkness, are those steep ways and cañons I have passed, leading from the far Montaña. But the mist-sea is rising, urged by some evening breeze—appalling masses, which break over dim distant peaks like awful billows. They rise slowly, surely, terribly, as if to engulf even the high point whereon I stand. But night is at hand, and even as they rise they are dispersed or covered by its sleepy pall. A single and glorious jewelled planet has dominated the eastern escarpment, and gleams softly down upon the closing scene."

We duly arrived at Phara, and breakfasted at the home of the "cura," and in return for his hospitality photographed the ancient church there. Within this building is an enormous altar composed of mirrors and brasswork, which latter was at one time covered with gold and silver. The point of interest about this altar was that it had originally belonged to the church at Aporoma, I was informed, which had stood in the village there, the vestiges of which, as I have described, are now buried under the dense vegetation—the growth of generations.

At Limbani I paid off the Indians, and, having with great difficulty secured mules, we again ascended the steep eastern slope of the Cordillera, and arrived at Aricoma, before described. The Indians gave themselves over to a carousal at Limbani, and I may here mention the evil effects which are being produced in the regions of the Cordillera by the abuse of alcohol among the indigenes. I have on some occasions had to waste several days in attempts to secure beasts and a guide in these interior towns, but, nevertheless, have met cavalcades of twenty or thirty mules or horses entering or leaving the place, and loaded with—what? Square tins of alcohol! This terrible stuff is alcohol of 40°,

made from sugar-cane, and enormous quantities are consumed by the Indians, who will go to any lengths to obtain it. At times it is impossible to purchase a piece of bread in the native shops, or anything in the way of provisions, but, nevertheless, they are all replete with bottles of this "aguardiente," or rum. I have seen huts covered with the sides of the empty tins, and in one place the church is actually roofed with these tins! It is a lamentable state of affairs, and must lead to the diminution of the working population, but its remedy seems to lie only in the hands of the wealthy sugar-growers, who make the rum, and who are sometimes the legislators of the country.

The lake of Aricoma runs north and south, about 2 leagues in length. Its depth seems to be very considerable, as I have observed in many other similar lakes which are so remarkable a feature of the Cordillera of the Andes throughout its length. The existence of these numerous bodies of water, actually astride the summit of the mountain range, is a matter which arrests the attention of the engineer, and probably some day they will form a valuable source of hydraulic power.

Our journey was slow, for my companion was not a good horseman, and a heavy snowstorm overtook us upon the edge of the lake. Night was approaching, and the group of Indian huts we had expected to reach was still many miles distant. It was useless to proceed, and I called a halt. The only shelter was that afforded by the remaining walls of an ancient Inca ruin, and I formed a sort of tent by securing the corners of the sheets of my bedding into the interstices of the stonework with stones rammed in. Under this we arranged our couches, and made coffee over our spirit-lamp, afterwards obtaining a few hours' sleep, whilst the snow steadily piled up on our fragile roof. Notwithstanding the altitude—15,000 feet at this place—it was not very cold, the thermometer scarcely going down to freezing-point, which was fortunate.

Instead of returning over my original route, I had decided to extend my journey to include others of the auriferous regions of the provinces of Sandia. We therefore followed a south-easterly course along the tableland which forms a plateau below the snow-capped peaks at an altitude more or less equal to that already recorded, with the town and mines of Poto as our objective point.

The topographical and geological formation over this distance is remarkable. Our way lay principally along the bank of the Poto river which runs through extensive pampas or plateaus, as above stated, of auriferous glacial or alluvial drift. In many places the Indians work on the banks of the streams by the method known to them as "acochar," which consists in damming the water up in a small reservoir, and then allowing it suddenly to flow out and impinge against a bank or area of auriferous material, washing it down into a rude stone-paved sluice, where the gold is recovered. These auriferous pampas and banks, which cover distances of many leagues, are probably deposits formed by

glacial action upon the gold-bearing slates and quartz of which the Cordillera is composed. The stones and material are not water-worn, as in alluvial gravel elsewhere, but are angular, and contained in an ashen-hued soil, carrying the gold. The pampas are strewn with boulders of white quartz for many leagues, which catch the rays of the sun. The more broken portions of the plateau and the lateral valleys are covered with pasture, and hundreds of thousands of head of sheep, llamas, and alpacas abound. I encountered large herds of vicuña, and quantities of geese, ducks, etc., upon the numerous small lakes. Some of these plateaus have probably been at a former epoch lake bottoms, and, indeed, I passed through remarkable formations, consisting of long "shores" of conglomerate, or indurated gravel, which stood up in vast cliffs underlaid by caves, and which latter were the home of thousands of "vizcachas," or native squirrels.

The town and mines of Poto are at an altitude above sea-level of nearly 16,000 feet. Very extensive mining has been carried out here by the Indians before and during the Spanish *régime*, by the method previously described of "acochar." There is at present a modern plant working by the "hydraulic" method, with water under pressure, upon an enormous moraine of gold-bearing detritus. The huge bank descends from the Cordillera of Ananea, above the line of perpetual snow, a few miles distant. There are also mines at Ananea, more than 17,000 feet elevation, and these workings are certainly among the highest on the globe. During my stay at Poto (in September) the thermometer registered generally 104° Fahr. at mid-day, in the sun, and 37°·4 Fahr. in the shade, by which it will be seen how considerable is the range of temperature due to heat of the sun and the rarefaction of the air. Nevertheless the cold is not intense even at the coldest season, although snow and rain storms are frequent and severe. Terrible thunderstorms occur, and the lightning continually strikes exposed points. I may here mention that the presence of electricity in the atmosphere, even at normal times, is very noticeable. The fur boas which one wears as protection against the wind, and one's clothing, "crackle" in a remarkable manner when the least friction is applied. The same effect is strongly produced in combing one's hair, and if it be done in the dark, sparks are observed to be produced by the friction of the comb.

Leaving Poto, I continued my journey alone, except for my Indian guide, still in a south-easterly direction, with the intention of skirting the northern end of Lake Titicaca, and arriving at the station of Juliaca, on the southern railway of Peru.

The country was entirely covered with freshly fallen snow. The temperature was like that of the breaking up of an English winter and the coming of spring, for the air was soft and mild in the early morning. Beautiful white cumulus cloud-masses against a glorious blue sky, with a bright sun, were reflected in the mirror-surfaces of the numerous

small lakes I passed. Magnificent water-fowl swam upon these lakes, and I obtained one of them with a shot from my long-barrelled Colt's revolver—this not as a wanton taking of life, but that the bird would supply the scarcity of provisions I knew I should encounter on the morrow.

Bands of vicuña stared wonderingly as I passed, and one splendid fellow—a sentinel upon a knoll—is almost within reach of the revolver's range, so near that I am tempted to try a shot. But I might have saved my cartridge, for he and his ten companions are away like the wind, only to stop and utter their curious and plaintive, protesting or warning cry 300 yards away, where they stand gracefully and gaze at me.

Ever these glorious white, cloud-massed, cumulus columns, upward flung into the blue empyrean; ever these silent and virgin everlasting peaks of eternal snow, which I am paralleling, upon the Bolivian border, and whose mysterious cañons and violet snow-cornices blend from time to time with the fleecy mist-matter above them; ever this unbroken solitude, and the feeling of being upon the top of matter; and ever this extensive silence, undisturbed save by the cry of the "alcamarini"* or the vicuña. Strange and beautiful region, working out some function of the world's changes in the plan of Nature's ceaseless and inexplicable operations!

But the late afternoon advances, and a bitter wind arises from the snow-clad Cordillera and changes the aspect of all, and the sun has long since set, when, cold, hungry, and weary, I arrive at the town of Cojata. The industry of the people here is the breeding of alpacas, and the buying and selling of wood. Gold-mining is also carried out, and a considerable trade done with Bolivia in the "aguardiente," or rum, before spoken of. Cojata is very near the frontier-line of that country, which there consists of a small stream intersecting the pampa (part of the river Suchis). The vast glacial moraines of gold-bearing detritus are still a feature of the region, as are also the pampas of similar material; and there is no doubt that these provinces of Sandia and Carabaya form one of the most important auriferous regions in the world. The Bolivian and Peruvian Indians here speak nothing but their language of Aymará. They, men as well as women, wear their hair in long "trensas," or queues, like Chinamen, and they often have a distinctive dress and head-gear, highly ornate. Their principal diversion appears to be the consumption of aguardiente, accompanied or followed by a "jarania," or fandango. Physically, they are by no means an inferior race, and the women are often of fair height, robust, and not unattractive in appearance, save that they are unwashed. The altitude of Cojata is about 14,800 feet.

Leaving this point, the trail ascended an eminence, from which

* A white gull-like bird.

I got a faint and momentary view far to the south of the famous peak of Sorata (or Llampo) (23,600 feet altitude), in Bolivia. Passing now downwards and through areas of a remarkable rock-formation of hard white sandstone, lying in horizontal strata, the trail descends rapidly towards Lake Titicaca, and at every turn of the road I strained my eyes in search of its blue surface—my first approach thereto. At length I beheld it, still far off, and between the barren and rocky hills which I had to pass before reaching my halting-place—the town of Huancané. The first view of Titicaca was very beautiful.

From Huancané to Juliaca is a long day's ride, and, having secured a guide, I left before sunrise. The road lay at first through the lands cultivated by the Indians, and the swamps and marshes bordering upon the lake. These latter places are dangerous, and it was necessary to wade through a sheet of water, with my horse submerged to the saddle-

INDIAN HOUSES NEAR LAKE TITICACA.

bags. One may also cross by means of the curious "balsas," or rafts, which the Indians use for navigation, and which are constructed of masses of woven rushes. At one portion of the route the scenery is exceedingly picturesque. There are areas of yellow water-weed, from which numerous scarlet-feathered herons arise as the traveller passes. The tips of the white cordillera are reflected in the blue surface of the lakes, and the remarkable conical-shaped houses of the Indians give a character to the scene not found elsewhere in Peru. I examined some of these houses; they are square at the base, built in regular courses of adobe bricks. Each course is set in from the lower one, and thus the structure becomes a cone, curved in profile, and circular on plan in the upper portion.

After sundown the cold became intense, due to the bitter blast which swept across the plateau from the lake. The altitude of Titicaca is 12,578 feet above sea-level. My guide had brought me by a longer route than was necessary, and it was not until 9 p.m. that I drew rein

upon my wearied horse before the station hotel at Juliaca, where I again enjoyed the luxuries of a good dinner and comfortable bed, after nearly two months' journeying in those interesting but inhospitable regions—inhospitable not as regards man, but nature.

As will have been seen, some of the portions of the country I traversed are very little known, and upon the verge of the "Montaña," uninhabited. The most easterly point at which I arrived, near the junction of the streams before mentioned with the Huari-huari, or Inambari river, is south-west of and only about 25 or 30 miles from the port Markham, on the navigable river Tambopata, a port named after the late President of the Royal Geographical Society, whose work and interest in the country are always gratefully remembered by Peruvians. I had desired to extend my journey to this river, but the circumstances already described rendered it impossible.

The region is one of vast possibilities, both as regards the auriferous plateaux and the zone of the Montaña, which is healthy, and capable of producing crops of any kind after clearing and cultivation shall have taken place. Roads, however, or branch railways must be built before much colonization can be brought about, and some advance is already being made in this respect. When the project of uniting the railway system of the Pacific with the navigable headwaters of the Amazonian fluvial ways is carried out, a beginning will have been made in the opening up of one of the most valuable portions of the Earth's surface.

II. Huancavelica and Adjoining Departments.

To reach the interior of Peru, and the rich mineral-bearing zone upon the eastern slope of the Andes, the traveller must, from the Pacific littoral, invariably cross the summit of the Cordillera, for this vast natural barrier runs parallel with the coast, and leaves no pass, speaking generally, at a less altitude than 14,000 or 15,000 feet above sea-level.*

The Department, or state of Huancavelica, which I visited in November, 1904, is one of the richest of the mineral-bearing regions of Peru, but it is difficult of access, due to its mountainous nature and to the fact that no roads, worthy of the name, have yet been constructed to give outlet to its products or communication with the coast. My way lay by the port of Pisco, about one day's steamer journey south of Callao, and past the town of Ica, a few miles from the port, with which it is connected by a railway. Ica is the centre of a fertile agricultural district, where cotton, sugar-cane, wine, brandy, etc., are produced. The crops here, like all those of the agricultural regions upon the coast zone, are grown under irrigation, for, as is well known, the whole of this vast stretch of continent, from Ecuador to Chile, is a

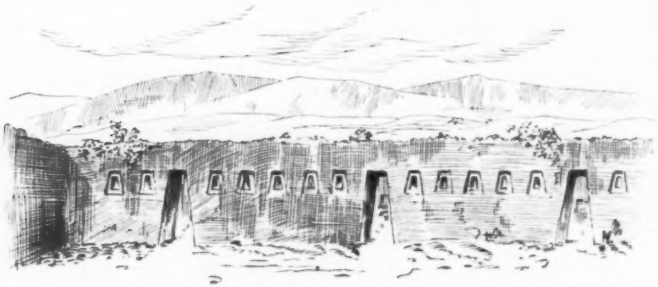
* There is an exception to this near Payta.—C. R. E.

rainless region. Vegetation exists by virtue of the streams of water descending the western slope of the Cordillera—streams which have their origin in the ceaseless thawing of the ice-cap, and the heavy rains of that lofty region. For the Andes, having deprived the western zone of its rainfall by reason of the climatic conditions brought about through its agency, has, in part, remedied the defect by giving origin to these torrential streams.

My first day's journey lay across the usual sterile desert zone

between the coast and the foothills of the Cordillera—deserts over which the wearied horseman toils from sunrise to sunset. There is a group of extensive Inca ruins upon the desert, which I examined in passing. The principal feature is a large courtyard some hundreds of feet in length and width, with a series of doorways opening therefrom. Between these doorways, which are symmetrically spaced, are niches, and both are of the tapering form so often seen in Inca architecture. A portion of one wall is shown in the accompanying sketch. The walls were of adobe and rough pieces of stone, the

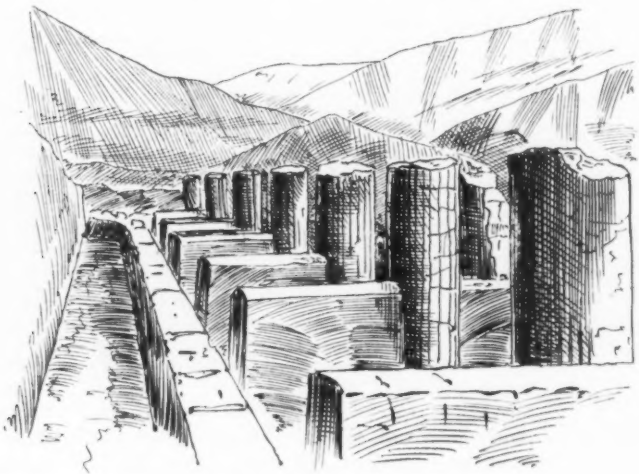
whole being made into a smooth surface with plaster formed of mud or clay. The general face of the walls has been coloured with red paints, and the niches with yellow paint or pigment. Parts of this colouring still remain, notwithstanding the centuries that have passed



INCA RUINS NEAR PISCO, PERU.

over it. The pigment may have been formed of iron oxides, or possibly vermillion from the cinnabar mines of the interior.

Regarding these ruins upon the coast zone, it has been a matter for observation that they are not built like those of the interior—of cut



RUINS OF INCAHUASSI. INTERIOR COLUMNS.

stone—and they still exist only by reason of the rainless climate and the climatic conditions, which tend towards exceedingly slow disintegration.

Whilst speaking of this immediate region, I may mention the ruins

of "Incahuassi" (house of the Inca), which are found some 50 miles to the north-west of this point, near the coast also. They are chiefly interesting as showing the use of columns in Inca architecture, various writers upon Peru having asserted that columns were unknown, to those builders. They are shown in the accompanying sketch; they are 65 to 85 centimetres in diameter, and the ruins are stated by Señor Larrabure (an archæologist and late minister of foreign affairs in Peru), who visited them, to belong to the fifteenth century.

At nightfall I arrived at Humay, a hacienda upon the Pisco river, from which its extensive vineyards are irrigated. This place, although peaceful and picturesque, has not left a pleasant impression upon me, for during the night my room was invaded by swarms of mosquitoes, whose stinging was the cause, undoubtedly, of the "tercianas," or intermittent fever from which I suffered afterwards.

Upon leaving this point I knew little of the hardships I should be obliged to endure for the remaining four days of my journey to my destination. The road by which I had been directed passed through a portion of the country void of towns or villages, and consequently of food of any kind, notwithstanding that I had been informed that such was available. The arriero who conducted my pack-mule and served as guide was almost constantly drunk with aguardiente, and, as far as I could observe, took no other nourishment (!) during the last three days' travel. On two occasions I searched his saddle-bags and confiscated and destroyed the bottle of alcohol he carried, but he again obtained supplies of this from acquaintances among the Indian shepherds *en route*. These people were also drunk, even early in the morning, and there is no doubt that the effects of alcohol is beginning to ruin the inhabitants of these regions, as I have elsewhere observed. Due to the effects of the fever, I could not touch the coarse and scanty food of these shepherds' huts; at night the cold was intense, for we were now at a considerable altitude, and I had foolishly neglected to bring my cot or a mattress, desiring to travel rapidly without impedimenta.

There was nothing for it but to get out of the situation, and although I could scarcely mount my mule I was obliged to keep on, driving in front of me the drunken arriero and the pack-mule. Towards the close of the last day a violent attack of vomiting came on, and I fell rather than got down from the saddle, and lay upon the plain utterly exhausted. The altitude was 16,000 feet above sea-level, the air exceedingly rarefied, and a bitter blast swept across the plateau. I thought for some time that I should never rise again from the spot, and it was only by an effort of will that I did so. But I managed to swallow two or three spoonfuls of condensed milk, and, mounting with the aid of the arriero, who was now sober and penitent, I continued onward, and near midnight arrived at my objective point—Santa Inez.

Situated here are the silver-mines of Quespisisa, or Santa Inez, which

have produced great quantities of that metal. They contain extensive bodies of ore, which will be made available upon further working. Hydrographically, the region is interesting also, for there are two large lakes of true Andean character here. The higher, known as Lake Orcococha, is 16,000 feet, and the lower, Lake Choclococha, 15,600 feet above sea-level. They are separated only by a distance of a few thousand yards, the upper being dammed up with a natural dam formed by a moraine of soil and gravel. A noteworthy feature of this lake-basin is that, although it is upon the western or Pacific side of the summits of the Andes it nevertheless is drained into the eastern or Amazonian watershed, by means of the river Pampas, which breaks through the Cordillera and so into the Apurimac river and headwaters of the Ucayali and Amazon. Close at hand, to the west, and at slight difference of elevation, are other smaller lakes, which give rise to the Pisco river flowing to the Pacific. Here, then, is another of those numerous instances which are met with in the Andes, where the water-parting of the continent is defined by a lake, a part of whose waters in times of abnormal flow may positively belong to the one or to the other of its adjoining watersheds. There is no fish-life within their waters, a common characteristic of the lakes in these high regions. Each is 5 or 6 miles in length and about $1\frac{1}{2}$ in breadth; whilst at a depth of 250 feet, I was informed, bottom was not reached in the middle. Their blue surfaces reflect the snow-capped range to the east, but in the rainy season are lashed into fury by the terrific thunderstorms of this altitude.

The general rock-formation is a trap, whose terraced lines are seen far off upon the peaks, as they emerge from beneath the ice-cap. A remarkable peak of diorite stands solitary, not far from the lake-shore, and is known among the Indians by the name of Quispijahua, which means "the flower of glass." This name is due to its form, for at the summit it spreads out into almost a petal-like shape, a result partly of geological formation, and partly to its having been continually riven and split by lightning strokes. It is reverenced by the Indians, and legends have been woven around it.

The whole of this region, from Castrovirreyna on the west to Ayacucho on the east, is exceedingly rich in minerals, including silver, copper, gold, as well as salt, and in places coal, all of which, when the country becomes more known and opened up, will be valuable elements of industry. The highest elevation at which I arrived was 17,500 feet, just below the ice-cap.

After a sojourn of about two weeks in the neighbourhood, I continued my journey in a north-westerly direction. But my troubles were not yet over, for I was again attacked by the "tercianas," and rendered unable to go on. These intermittent fevers have the characteristic of quite suddenly depriving one of one's strength, and there was nothing for it but to give up the idea of reaching the next village and to sleep

out upon the "puna," or plateau. Fortunately, the temperature fell but little below freezing-point. During the night the arriero—not the former one—let the mules escape, and was obliged to follow them, leaving me alone and unable to get up for the whole of the following day. The sun blazed down, and I was consumed with thirst, and nevertheless unable to reach the shimmering blue lake which lay within 100 yards of me! At length I beheld afar off an Indian approaching with some llamas, and I hailed him. But, after the manner of his kind, he was afraid, and, instead of coming towards me, he quickened his pace and soon disappeared. I suffered greatly from thirst, and with the sun and the fever was almost delirious, and still no sign of the arriero. I managed to reach my saddle-bags and took a mouthful of extract of coffee, which revived me a little, but what I wanted was water. Again I saw another Indian, towards the close of day, and as he came within hearing, I called him, not this time, however, in Spanish, which might have had the same effect as before, but in the few words of Quechua which I was able to employ. "Shami! yacu-t-apami!" ("Come here! bring some water!") I shouted; and the poor Indian, gathering probably some confidence from being addressed in his own tongue, came up to me, and, following my directions, brought me water from the lake. I rewarded him with a silver dollar, and he stayed by me until nightfall, when the arriero returned with other animals from the hacienda.

After a loss of various days I arrived at the city of Huancavelica, 14 leagues from Santa Inez, and which can be accomplished in one long day's hard riding. The country passed over was the usual treeless puna, alternating with lakes, swamps, rocks, and streams, and generally covered with grass, which gives pasturage for herds of cattle and sheep. The climate is exhilarating, and the views magnificent, and in the intervals when the fever did not trouble me, I enjoyed the ride and the unfolding landscape.

At Huancavelica are the famous quicksilver-mines, which are generally mentioned in all geological treatises. The history of the mines would fill a bulky volume. They were discovered in 1566, and were administered under a Spanish viceroy, and since that period have produced approximately 60,000 tons of mercury from the cinnabar ores, which exist in an enormous lode, or "farallon," to use the Spanish term. In 1786 bad work caused the mine to collapse, and it is stated that five hundred Indian miners remained entombed therein. Huancavelica was visited and described by both Bufon and Humboldt, as also Raimondi. I penetrated into some of the vast subterranean caverns which have been excavated to extract the ore, and made an examination of the general conditions of the region, in order to draw up a report thereon. The workings are about 2400 feet above the level of the cathedral and city of Huancavelica, which latter is at an elevation of 12,300 above

sea-level. The Huancavelica river flows through the city, emptying lower down into the Mantaro, which in its turn falls into the Apurimac, before mentioned, and so into the fluvial system of the Ucayali and Amazon. The Mantaro river, almost alone of Peruvian rivers, runs in this part of its course to the south-east, or directly opposite to their general north-west direction, over nearly 3° of latitude to where its course abruptly changes near Huanta. The climate of Huancavelica is cold, but temperate. Alfalfa and cereals are not produced, owing to the altitude, and the principal industry is that of cattle, but was formerly, and some day must again become, mining. The general geological formation is limestone and sandstone, and hot springs occur, and are used as baths.

Leaving this remarkable place, my way lay across a lofty "puna," some thousands of feet above the town; for, notwithstanding the marvellous wealth in minerals that the region has produced, no road has been made beyond the primitive mule trail to the outside world. Such was the Spanish method of mining, from which no benefit accrued to the community, who toiled and died to enrich an arbitrary and distant monarch. The arms of Spain carved on the stone at the portals of the mine, with figures of saints, and ruined churches, are the principal remaining vestiges of this *régime*.

Descending rapidly from this plateau, the track passed into the valley below. The change from these dreary and inclement altitudes to the warmer climate of this valley was very agreeable, especially in my still weak state. The piercing wind gives place to a balmy breeze, and the dry grass of the puna changes to other vegetation. I pass a tree, and recollect "Thalaba and the Sledge"—

> "Behold! the signs of life appear,
> The first and single fir!"

It is not a fir; there are no firs on the Andes, but it is a real tree although a wind-beaten specimen, drawing its scanty nourishment from the rocky soil, and stretching its attenuated boughs athwart the path. A tree! the first I have seen for weeks. It has green leaves, and, moreover, a bird carols in its branches. A little lower down a patch of celandines and dandelions bring to my senses a waft as from England's lanes. Here, also, are glorious masses of yellow acacia, and other flowers and shrubs on either hand, through which my mule brushes as we descend. But what is this—this sweet familiar perfume which suddenly greets me? Familiar, although for the moment I cannot recognize it. I look about, and, behold! there it is—a low hawthorn bush in flower. Its leaves are somewhat different in form from those of English hawthorns, but there is no mistaking the well-known dark-green hue and glossy sheen of the leaves, nor the little white flowers and the sweet subtle perfume which carries the mind momentarily to another land. It is "may"!

I pass through the villages of Acobambilla and Huando, ascend and pass a high ridge, and again descend by steep and rapid zigzags down the sides of its cañon to the river Mantaro, or Jauja, before mentioned, and sleep at the town of Izcuchaca, 10 leagues of a broken, steep, and tortuous road from Huancavelica.

Izcuchaca is somewhat of a strategic point. A stone bridge crosses the river, and the place was generally promptly taken and held by various revolutionary forces in times past, as it commands the road to the interior of a large and important part of the country. I found the greatest difficulty in obtaining anything to eat along the whole of this route. The Indians are of a surly and suspicious character, and will sell absolutely nothing to the traveller. In Izcuchaca I had expected to find an inn and some comforts, but the place was dominated by a Chinaman, who was the "gobernador," as well as the owner of the inn. This individual, due to some caprice which I was unable to explain, absolutely denied me food and shelter, and even several Peruvians of respectable appearance who were standing by failed to offer such or indicate where it could be secured, notwithstanding that they knew I was a stranger, a traveller, and that night had fallen and a heavy rain set in. This is the only place in Peru where I have experienced such a lack of hospitality, and I retain an unpleasant impression of the place. But I found shelter at length in the hut of a humble but honest individual, who, moreover, obtained alfalfa for my animals, which was the most important, for they had eaten but little for several days. There was no food in the house, and it was too late to purchase anything in the place, and all that I and my arriero could obtain was a cup of weak tea and a piece of dry bread from my saddle-bags, the only food of which we partook until the following night upon arriving in Huancayo.

On the next morning at daybreak, I shook the dust off my feet of Izcuchaca. My road now lay along the bank of the rapid river for some distance. Leaving that I crossed another high ridge and plateau, and at length descended into the large and fertile plains of Jauja, and slept in a fairly comfortable inn within the important city of Huancayo, 13 leagues from my last stopping-place. This plain, through which runs the river Mantaro, or Jauja, that I had been more or less following, is one of the finest agricultural regions in Peru, and crops of every description are produced. Not far away are extensive and valuable mines of good coal, as well as of copper and silver.

From Huancayo to Jauja, my next day's journey, the road is flat, and passes through numerous towns and villages, which, with their cathedrals, squares, and trees, present a restful and old-world appearance. The altitude of Huancayo is 10,686 feet, and that of Jauja 11,874 feet, the distance between the two cities being 10 leagues. The small Indian shops all along this route seem to contain little but bottles

of "aguardiente," or rum, and a great deal of drunkenness is encountered among the Indian labourers.

On the morrow I began my last day's journey in the saddle. The road left the pleasant valley and wound up on to a high, cold plateau. Fourteen leagues lay between Jauja and my objective point, Oroya, the terminus of the famous Oroya railway, where I should take the train for Lima. It is a remarkable thing that the inhabitants of Jauja and of the numerous towns of the valley have been content to live through the many years since that railway was constructed without making any attempt at a road for vehicles which would give them cheap and comfortable communications therewith. The existing trail is simply a track over the limestone strata, where the wearied pack-trains stumble ceaselessly, in the same condition almost as when the Andes were upraised from chaos. However, this is now being remedied by the construction of a branch railway from Oroya.

The altitude of the latter place, where I arrived in the late afternoon, is 12,178 feet above sea-level, and the railway thence rises at the summit of the Andes to the west to 15,642 feet, the highest in the world, and doubtless the only existing instance where the traveller is carried from the limit of the perpetual snow-cap to sea-level in a few hours. Near Oroya great activity is being displayed upon the Cerro de Pasco mines, which are said to be the largest copper deposits in the world.

The region which I traversed is but little known outside the country. It is embraced between the parallels of 11° and 14° S. lat., and 77° 10′ to 74° 45′ meridians west of Greenwich. It is a region of great resources, and will undoubtedly be the scene of an early development, for the dawn of an era of progress is upon the old empire of the Incas, awakening it from its years of stagnation, and giving it a place among the progressive nations of its hemisphere.

RECENT CHANGES IN THE COURSE OF THE LOWER EUPHRATES.

By H. W. CADOUX.

In the various descriptions which have been written during the last few years concerning the country which the so-called Baghdad or Persian Gulf railway is to pass through, there has been a somewhat marked absence of information about the country south of Baghdad which must be traversed by the railway to its ultimate destination on the Persian Gulf. The following notes of a journey made down the lower Euphrates from Baghdad in September, 1903, may therefore not be altogether devoid of interest.

Recent events have transpired in that portion of Chaldæa between Musseyib and Samawa which, besides being of the gravest local importance, are of general interest, throwing as they do a certain amount of light on the way in which large tracts of country, the scene of former activity and cultivation, come to be abandoned, and are to-day buried many feet deep in the sand of the desert.

Few people who have read Mr. Ellsworth Huntington's stirring description of the upper Euphrates in its headlong course through the gorges below Harput, or who have watched the powerful sweep of the middle Euphrates through the basalt-capped hills that hem it in at Halebche, would recognize in the dry and sandy bed that now stretches from Musseyib to Samawa, the original course followed by these historic waters in their never-ending journey towards the sea.

From Baghdad to Musseyib on the Euphrates, the road, which goes almost due south, crosses a flat and in summer very dusty plain, scarred with the remains of many ancient irrigation canals, a few

FIG. 1.—EUPHRATES FLOWING BETWEEN BASALT-CAPPED HILLS AT HALEBIYE (HALEBCHE), 30 MILES NORTH-WEST OF DEIR-ES-ZORR, LOOKING NORTH.

of which are still utilized during flood-time. It is otherwise devoid of any special feature of geographical interest.

This main road from Baghdad to the pilgrim shrines west of the Euphrates crosses the river by the bridge of boats at Musseyib, hundreds of pilgrims passing over the river daily to Kerbela and Nejef. The river flows here in a broad placid stream 175 yards or so in width, with a maximum depth of 14 feet in the dry season. Its banks are from 8 to 14 feet in height, composed of alluvial sand of varying degrees of fineness and with little or no cohesion. This lack of cohesion has doubtless had considerable influence in bringing about changes in the lower parts of the river's course. The current during the dry season is about 1500 yards per hour, and this increases to quite 4 miles per hour during flood-time, when the river, swollen by the melting of the snows in the highlands of Turkey, rises to 10 feet above the low-season level.

A detailed account of the way in which the waters of the Euphrates have abandoned their original bed below Musseyib would be a long one, involving a good deal of local history. Briefly, the causes contributing to this unfortunate occurrence may be divided into those of a natural origin and those directly attributable to the hand of man.

The chief natural cause has been the gradual heightening of the bed and banks of the river above the level of the surrounding country

by the silt and sand brought down, especially in flood-time. From almost time immemorial the waters of the Euphrates have escaped during the flood season to the lower country west of the river, forming large marshes, amongst others the Bahr Nejef. According to the unvarying account of natives who have visited the Bahr Nejef in recent years, a great part of it has dried up, and palm gardens are now planted in many places where its waters held sway. No doubt this is due, in a measure, to better drainage by the Hindiye canal, and also by a diminution of flood water from the Euphrates.

This formation of marshes in a direction roughly parallel to the rivers from which in flood-time they derive their waters, is a very noticeable feature in the country traversed by the lower Tigris and Euphrates. Their existence would seem to indicate that the rivers in question have, in the main, kept to their present beds for a time sufficiently long to allow the deposition of enough silt to raise them appreciably above the original plain through which they flowed.

The first blow dealt at the lower Euphrates was the opening of the Hindiye canal, the entrance to which has been changed a good many times, but always kept somewhere near Musseyib. Probably in its origin only an irrigation canal, it had attained a breadth of 85 yards twenty years ago, and to-day is some 200 yards broad in the same place. Its course being fairly straight and running along the

FIG. 2.—BROKEN BARRAGE AT MOUTH OF HINDIYE CANAL, 5 MILES BELOW MUSSEYIB. TO THE LEFT, HINDIYE; TO THE RIGHT, EUPHRATES, LOOKING NORTH-WEST.

FIG. 3.—BED OF EUPHRATES AT MAHNAWIE, BELOW THE BARRAGE, LOOKING WEST.

ground west of, and roughly parallel to, the Euphrates, the current of water is sufficient to not only keep the bed clear of silt, but to deepen it in places by scouring.

In order to save the country lying along the lower Euphrates between Musseyib and Samawa from the destruction which threatened it, the Turkish Government had a barrage built across the present mouth of the Hindiye canal 5½ miles below Musseyib. This raised the level of water in the Euphrates bed by 2 metres, causing a third of the total stream to pass slowly along the original bed, the remaining two-thirds finding their way down the Hindiye canal and eventually joining the Euphrates near the town of Samawa.

Amongst the causes attributable to human agency, and leading to the present disastrous condition of affairs, may be mentioned the irrigation methods adopted by the Arabs dwelling near the river from Hilla downwards. Noted for their lawless character, they have effectually resisted all attempts on the part of the Turkish Government to regulate the use of the river for agricultural purposes. By means of large canals, one of the most noted being the Daggara canal below Hilla, the Arabs have for many years past led away a very large proportion of the water to the low ground east of the Euphrates. Using a part of this water for their rice and grain-fields, they, with the improvidence which characterizes their daily life, allow a vast amount to run away into the marshes. This lessening of water in

the river has had the effect of increasing the deposition of silt in the river-bed. The Arabs on the Euphrates below Divaniye, unable to irrigate their fields with this diminished stream of water, resort, during the months of June and July, to the building of "sukurs," or dams, across the bed of the river. The sukurs, which are composed of baskets filled with clay, faced with the same material, and protected in parts with matting, are put down in sets of three. The first sukur has a gap of about 8 feet, and the last down-stream three outlets of about a foot each. This artificial slowing down of the current must tend to increase the silting-up of the bed above the sukurs. Another factor not without importance is the great quantity of wind-borne

FIG. 4.—BED OF EUPHRATES AT ANANA, NEAR BABYLON. WORKMEN DEEPENING THE BED, LOOKING WEST.

sand deposited in the river when its transporting power has been reduced to a minimum.

The final *coup de grâce* was dealt by the breaking of the barrage at Musseyib in July, 1903, the immediate result of which was to leave the lower Euphrates river-bed dry for a distance of nearly 150 miles, the whole volume of water passing down the Hindiye canal. Only during the few weeks of high flood does a very limited amount of water find its way down to Hilla and the villages below, and it is doubtful whether any would find its way down as far as Samawa.

Such is the brief and sad history of a tract of country where for centuries stately palm trees waved their heads over the fertile waters flowing at their feet, and where sailing-craft with their burdens of grain and dates moved slowly down, praying that Allah would give

them favourable winds to carry them without mishap to Basrah. A few more years under the conditions now obtaining, and the great Chaldæan plain will claim its victim. Of a once populous and cultivated area little will remain but a barren steppe, dotted with heaps of sand-covered ruins, where the desert robber will prowl by day and the jackal by night. Such is one phase of the river's influence in the history of man.

Our route from the Musseyib barrage to Hilla, where we arrived September 14, was *viâ* Mahnawie and mainly along the dry bed of the Euphrates. At Anana, not far from Babylon, a large number of Arabs under Turkish control were digging a channel about 20 inches deep in the river-bed, with a view to expediting the arrival of the water at Hilla as soon as the barrage was repaired.* The members of the German expedition carrying on excavations at Babylon were taking their drinking-water from holes dug near the river by their headquarters at Kweyrich.

Hilla presented a dismal appearance, its bridge of boats lying on the dry river-bed. Numerous holes were being dug in the deepest part of the bed for supplying the inhabitants and soldiers with drinking-water, which was found at an average depth of 3 feet.

Leaving Hilla, we travelled some 15 miles along the river-bed, passing by a number of palm groves and many villages, amongst others Dubla, Jerboa, and Heygan Saghir. From this point the palms ceased, and the banks generally assumed a less cultivated and prosperous appearance for the next 10 miles, being latterly dotted with a large number of fortified hamlets standing 200 to 300 yards apart. In many places large pools of water left in the depressions of the bed were slowly drying up under the intense heat of the sun. Some contained fish, which were often lying dead in an advanced state of decomposition on the edges of the shallower pools. At one large pool we came on a score or more of naked Arabs with conical fishing-baskets, busily engaged, with much shouting and laughter, in trying to catch the fish which dashed about in the muddy water in their efforts to escape. All along the way the universal cry that greeted us was "Ish wakt yeji mai?" ("When is the water coming?"), and the women would often come down the banks and run after us with ever the same question on their lips.

For the next 5 miles the river-banks, as well as the desert beyond, presented a more desolate appearance, many of the hamlets were deserted, and the fighting towers were beginning to show signs of decay. We were told that these mud towers with loopholes for

* It is hardly necessary to add that their expectations regarding the repairing of the barrage were not fulfilled.

fighting had been brought into use on this part of the river only during the last few years. The fortified hamlets of this and the preceding section were mainly inhabited by Daggara and Wisama Arabs, both of whom bear an unenviable reputation, the stopping and blackmailing of loaded craft having been one of their favourite occupations before navigation on the river ceased.

At a distance of about 30 miles by river from Hilla, we left the bed and rode southward across the desert to a hamlet belonging to the village of Jodare, and bordering on the river-banks. We were considerably impeded in our progress by a severe dust-storm, blowing from the south, and with some difficulty found, amid the many deserted

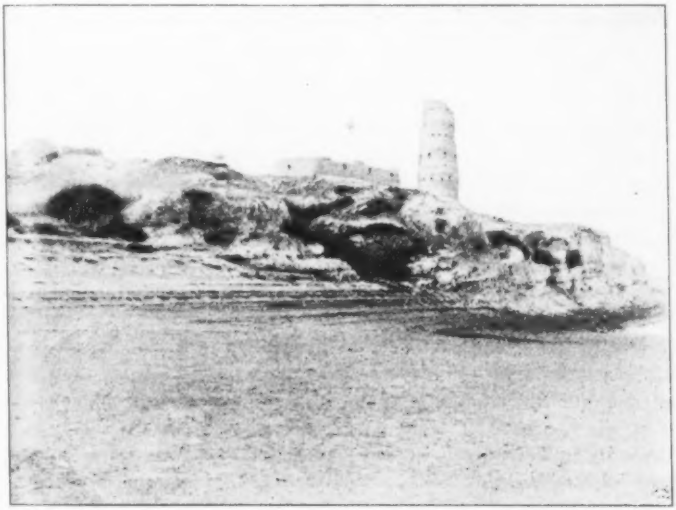


FIG. 5.—DESERTED HAMLET AND FIGHTING TOWER OF JODARE ON BANKS OF EUPHRATES, BETWEEN HILLA AND DIVANIYE, LOOKING SOUTH.

hamlets, one which was surrounded by a hedge, and bore signs of being inhabited. The Arabs occupying it showed considerable reluctance in responding to our call, but we were glad enough to eventually find shelter from the blinding dust-storm inside the square-loopholed tower, where they shut themselves up at night or in time of danger. The state of the country may be well judged from the fact that an Arab from another small village, whose services we had temporarily enlisted as guide, insisted on getting well away into the desert before we called out the occupants of the hamlet where we intended passing the night.

The following day, September 17, we journeyed on to Divaniye, keeping mostly to the desert road, which touches the river at points.

The nearer we approached Divaniye the more barren became the plain. The hamlets bordering the river were here and there occupied, but most of them seemed entirely deserted, and we were glad at last to catch sight of the palm groves of Divaniye through the dusty atmosphere.

The river-bed in this part has an average breadth of 90 to 95 yards, with banks between 13 to 16 feet high. The deepest part of the bed is almost invariably within 10 feet of the steep bank on the outside curves. Much tamarisk was growing on the inside curves. Divaniye looked even more forlorn than Hilla, and the bridge of boats, which in ordinary times gave it an appearance of importance, was lying ignominiously on the sand of the river-bed. From Divaniye to Samawa we followed the desert road for about 20 miles, to a small village on the river-bank, taking its name from the shrine of Imam Hamza, which stands in the desert about a mile to the west of the river. The country traversed between Divaniye and Imam Hamza was barren and sandy, the only vegetation visible being camel thorn, and a small desert plant with fleshy stems and leaves called by the Arabs "arid," and eaten by camels when nothing else is available. The hamlets along the river's edge, where we touched it, were nearly all abandoned, the inhabitants in most cases having trekked westwards towards the Hindiye, in order to find water for their cattle.

The desert just north of Imam Hamza was the nearest approach to the conventional desert that we had seen anywhere. Its surface, furrowed by the strong southerly wind that had been blowing for some time, was covered with miniature sand-dunes, and depicted a desolation that could almost be felt. Near the village of Imam Hamza the deposition of wind-borne sand in the river-bed was very marked, heaps of it between 18 to 30 inches in depth lying against the banks. It seemed, indeed, as if nature had turned her back on this unhappy river.

Below Imam Hamza the river-bed narrows down in some places to 40 to 50 yards, with banks over 18 feet in height. A further 14 miles by road, skirting the river, brought us to the small village of Abu Jowarir, where we passed a miserable night on the top of a mud parapet, tormented by sandflies, which were more vigorous and aggressive here than in any place we had yet seen. The desert south of Abu Jowarir towards Samawa loses its desolate appearance, and around the fortified village of Sheikh Tweyni we rode through some pieces of excellent pasturage. The ground was netted with both new and old irrigation canals. Below the village of Sheikh Tweyni we saw dari growing, the first we had seen since leaving Musseyib, and the broad expanse covered with its green leaves was a pleasant contrast to the barren country we had traversed on the previous day.

Samawa has the appearance of a prosperous Arab town. It has a large bazaar, and is visited by many Arabs from Nejd. According

to the maps, Samawa stands on the Shatt-i-Ateshan, or lower end of the Hindiye canal, some 5 or 6 miles before its junction with the Euphrates. To-day, however, the whole of the Euphrates water, including that which was until this year carried down in the original bed of the Euphrates, passes Samawa, the junction of the lower end of the Hindiye with the Euphrates being above Samawa. We were unable to visit the actual junction, but careful inquiry of a number of men who frequented the river revealed the fact that boats formerly ascending the river for Divaniye and Hilla passed up the Hindiye above Samawa, and entered the old Euphrates bed some two hours' journey (5 or 6 miles) above the last-named town. This passage from

FIG. 6.—BED OF EUPHRATES NEAR IMAM HAMZA, SHOWING TWO MONTHS' DEPOSITION OF WIND-DRIVEN SAND AGAINST THE STEEP BANK, LOOKING NORTH-WEST.

the Euphrates to the Hindiye canal above Samawa would seem to have been formed since Colonel Chesney's expedition, although it may have existed then in the shape of an irrigation canal.

Our voyage from Samawa to Nasriye by boat was a pleasant relief after the dust and extreme heat of the journey from Musseyib. Below Samawa, the Euphrates flows in a broad turbid stream with a breadth varying from 60 to 120 yards, between banks of alluvium 7 to 14 feet in height. Lower down towards Nasriye it broadens considerably, being about 300 yards across in front of that town. On our way down we passed extensive fields of dari near the river. Beyond them the desert and its scrub vegetation held unbroken sway. Large herds of

camels would come down occasionally to the river to drink, sometimes as many as a hundred animals at a time, the property of the powerful tribe of Montefig Arabs, who occupy the country south of the Euphrates here, but also pasture their flocks across the river.

Nasriye is destined to become an important town if the Baghdad railway extension to the Persian gulf is ever constructed along the course originally planned, *i.e.* crossing the river at Musseyib, passing Kerbela and Nejef, along the right bank of the Hindiye to Samawa, and the right bank of the Euphrates to Korna. Its position at the lower end of the Shatt-el-Gharraf makes it the natural centre for communication with the country lying between the Tigris and Euphrates, and it is, in addition, in the middle of a rich grain-producing country.

The Shatt-el-Gharraf (formerly marked on the maps as Shatt-el-Hai and Shatt-el-Amara, both names being now unknown locally, and never used) seems to have been originally a huge irrigation canal, which the spring floods from the Tigris have eroded, till in places along its course it averages over 75 yards in breadth, with banks of alluvial sand up to 18 feet in height. Commencing from the Tigris river opposite Kut, it runs southwards, passing the towns of Hai, Jelaat-sikker (corruption of Kalaat-es-sikker), and Shatra, dividing before it reaches the Euphrates into several channels, the principal one being near Nasriye. It is navigable along its whole length when the Tigris is in flood, and native craft pass up and down for a space of about four months during the year.

On our return journey from Nasriye, we rode along the Shatt-el-Gharraf to Kut, and thence along the Tigris to Baghdad. The country between Nasriye and Hai seems fairly prosperous, and there are many patches of cultivated ground along the edges of the Shatt el Gharraf. We saw here for the first time the use of long poles with a weight attached to one end, and supported on a pivot, used as in Egypt for drawing up water from the river by means of the bucket attached. The method used all along the Euphrates south of Musseyib is the "cherrid," or "kyart." This consists of a capacious leather bucket suspended over a bricked-in well, built in the river-bank, and having an inlet towards the river. The bucket is lowered into the well, and drawn out by a couple of oxen, to whose yoke the rope is attached, and who walk down an inclined plane dug in the ground so as to increase their pulling power.

From Kut to Baghdad the country away from the banks of the river Tigris is desert, dotted here and there with tepés and mounds, and furrowed with the remains of irrigation canals. There is the usual sparse vegetation, mainly camel thorn, and a species of dwarf mimosa, called "shokk;" but there is little that is beautiful in the desert in summer, except when the dull red glow which heralds the

approach of sunrise grows brighter, and, touching everything with shafts of pink and golden light, makes for a few brief minutes a glorious picture out of the sand and earth of the wilderness.

GEOGRAPHICAL WORK OF THE GEOLOGICAL SURVEY OF CANADA, 1900–1905.

By A. P. LOW, Director of the Geological Survey of Canada.

SHORT summaries of the geographical work of the Geological Survey of Canada were published annually in the *Geographical Journal* until the time of the death of Dr. G. M. Dawson, the late Director of the Survey. The present article is intended as a continuation of those summaries, and gives concisely the geographical work accomplished by the staff of the Geological Survey of Canada during the years of the present century.

The work of the survey may be divided into exploratory surveys of the more inaccessible northern portions of Canada, and the more detailed work necessary for the production of regional sheet maps. These latter are produced either in the flat in the eastern provinces, or with contours in the mountainous portions of the west. The surveys for the production of sheet maps are confined to the more accessible portions of the Dominion, in or close to civilization where exploratory work has already been done; in consequence, no attention is here given to the geographical results of this part of the work beyond an enumeration of the number of sheet maps published during the time under consideration. The account of the exploratory surveys, for convenience, is given in order from west to east, starting with Yukon territory and extending to Hudson bay and the Arctic islands of the east.

Exploratory surveys of the Yukon river and of several of its large tributaries were made by Dawson, McConnell, and McEvoy in the later years of the last century, and in continuation of these McConnell, in 1900, examined the Stewart river, a large eastern branch, from its mouth to Fraser falls, 200 miles up-stream. The survey of the upper water of this river was completed by Keele in 1905, and a survey from its headwaters across to and down the Peele river, a large western tributary of the Mackenzie river, was made the same year by Camsell. A number of the smaller tributaries of the Yukon have also been explored, and similar work has been carried on near the Alaskan boundary to the westward of the Yukon. As a result of these explorations, a fair idea of the geography and geology of Yukon territory has been obtained as far north as the Porcupine branch, which heads within a few miles of the lower part of the Mackenzie river, and there

remains only a comparatively small area between the mouth of the Mackenzie and northern Alaska at present unexplored.

The geographical work in British Columbia has been of a more detailed character, and has resulted in the production of several topographical sheets in the more important mining districts of that province. These surveys have been under the charge of Brock, Boyd, Leach, McEvoy, and Gwillam, and the sheet maps cover portions of Atlin district in the northern part of the province, with West Kootenay, Boundary Creek, Greenwood, Lardeau, and Rossland districts to the south of the main line of the Canadian Pacific railway: also the important Crow's Nest coalfields and other coal areas of the province. Examinations have also been made of restricted areas of portions of Vancouver and Queen Charlotte islands.

The exploratory trip of J. M. Bell and Camsell to the eastward of Great Bear lake has been the only one undertaken in Mackenzie district during the period under review. This exploration has been the subject of a paper already published in the *Geographical Journal*.

In the northern parts of Alberta and Saskatchewan, exploratory work was carried on by Camsell and J. M. Macoun, the former, in 1902, exploring the country west of Fort Smith on the Slave river, and extending northward from the Athabaska river to Great Slave lake; the latter, in 1903, examined the plateau country bordering the Peace river east of the Rocky mountains.

The exploratory surveys of McInnes, Dowling, O'Sullivan, and A. W. G. Wilson in Keewatin district have afforded much information concerning the country lying to the west of James bay, and includes the survey of the west shore of Hudson bay from Moose river to Cape Henrietta Maria, and from the mouth of the Winisk river to York Factory. These explorations also cover the country drained by the Severn, Winisk, Trout, Ekwan, Attawapiskat and Albany rivers, all draining into Hudson bay.

In northern Ontario and the western part of northern Quebec, the work of W. J. Wilson, O'Sullivan, McInnes, Parks, and Low has completed the surveys of many of the branches of the Albany, Moose, and Nottaway rivers, which empty into the southern part of James bay.

The *Neptune* expedition to Hudson bay and the Arctic islands, although primarily intended for political purposes, accomplished considerable geographical work. This included astronomically checked track surveys of the north-west coast of Hudson bay, from the mouth of Chesterfield inlet to the head of Wager inlet; the western coast of the southern half of Southampton island and the east shore of Ungava bay, from Cape Chidley to within a few miles of the mouth of George river. These surveys were made either with the ship's boats or with dog-sleds. Surveys were made from the ship of Fisher strait, between Southampton and Coats islands, the east side of Southampton

island as far north as Seahorse point, the south coast of Hudson strait between Cape Wolstenholme and Douglas harbour, thus closing the gap in previous surveys. Along the north side of Salisbury island soundings of over 230 fathoms were made, showing the deepest water in Hudson strait. Tom island, in the north-west part of Hudson bay, and Griper shoal in Hudson strait, were found to be non-existent. To the north surveys were made in Cumberland gulf, Baffin bay, and Lancaster sound whenever the coast was seen, and these resulted in a number of corrections to the charts. Considerable attention was paid to the movement of ice and to the currents, which will be of value to the future navigation of Hudson bay.

The above briefly covers the purely exploratory work of the Geological Survey, but its geographical work includes the systematic mapping of the more accessible portions of Canada, and, as will be seen from the accompanying list, this work has been carried on continuously in the older provinces, resulting in the preparation and publication of sheet maps on scales from a mile to an inch upwards, of portions of Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia.

List of Maps issued by the Geological Survey of Canada during the past Five Years.

General maps	3
Yukon	7
British Columbia	9
North-West Territories	9
Ontario	16
Quebec	5
Hudson bay	4
Arctic	1
New Brunswick	2
Nova Scotia	33

The present rapid increase in the mining development of Canada is putting a heavy strain upon the staff of the Geological Survey, and, in consequence, few of its members can be allotted to exploratory work in fields distant from civilization; so that, for the present season, no purely exploratory work is being undertaken, nor can it be until there is an increase in the present staff.

THE RESULTS OF THE FOUREAU-LAMY MISSION.*

Physical Features.

The second and third parts of this work have now been completed (the first part having appeared in 1902), and form two large and beautifully illustrated volumes, full of the most valuable data for the geographer. M. Foureau confines himself to giving a very exact account of the observations—geographical, geological, and biological—made by the members of the mission, and does not attempt to formulate any generalizations grounded thereon. Nor does he draw any definite conclusions, which he feels would still be premature without further investigation, on any of the geographical problems of the Sahara; at the same time his observations will go far towards enabling others to arrive at some solution of these problems.

Setting out from Wargla, the mission had to cross first the great "dune" area of the "Grand Erg," the mass of which is exceedingly difficult to traverse owing to its compact form and the absence of any passes cutting right through its four main parallel ridges (the highest points reach 1000 feet and more). Especially striking in this region of a purely wind-formed relief, though M. Foureau feels it must impress the traveller in any part of the Sahara, is the evidence of the immense power of air-currents both as erosive agents and agents of construction; he therefore devotes some space to a consideration of the formation and character of the dunes. He finds that they are not moving, having been built up over a rocky base which holds them fast, but they are continuously growing and covering a larger area. That the growth is slow is due to constant changes in the direction of the wind, by which the amount of deposition is limited. Under these changing currents, also, the superficial forms of the sandhills are continually altering, the crest-line taking different shapes, though its general direction is constant. New dunes are in process of formation, and small hills may be seen cutting right across an ancient track which can be clearly traced on either side of them. The sand has a large admixture of quartz with a calcareous cement; these are the chief destructive elements in the wind-carried material, and, as they are not lifted much above the ground, the greatest amount of "grinding" work is done near the base of the heights, producing the frequent steep slopes. Beyond the southern foot of the dune region the rocky plateau of the Hammada of Tinghert rises in a gentle slope, dropping about 250 feet in a steep escarpment to the south-west, below which lies the Wad Ohanet (or Jua), joining the great Wad Igharghar to the westward—the one easy route across the Tinghert plateau. This plateau is oriented south-west and north-east, as is the Grand Erg and the other main feature-lines of the Sahara, and is mainly composed of rocks of the Upper Cretaceous series, the escarpment being dolomite. A smaller region of sandhills (Erg d'Issawan) separates this from the next plateau of Tassili. These dunes rest, in the northern part, on a platform of calcareous sandstone, very friable, and in the south on a ferruginous sandstone of Devonian age, while in the central area a belt of Carboniferous rocks, about 625 miles long, extends in a north-west to south-easterly direction, outcropping at various points along this line. The massif of Tassili stretches from Amgid on the banks of Igharghar as far as Ghat, and has an orientation approaching north and south, with two successive lines of escarpment to the east. It is crossed only by a few goat-tracks, and is far from being easy to traverse.

* Foureau, F., 'Documents scientifiques de la Mission Saharienne' (Publication de la Société de Géographie). *3 volumes and 1 book of maps.* Paris: Masson & Cie. 1905.

The Devonian sandstone of which it is composed has been carved into rugged and fantastic shapes; a mass of turretted heights and sharp peaks reaching 4800 feet, and forming an impressive spectacle. South of Tassili the igneous region of the Central Sahara begins in the lava and basaltic plateaux of Adrar and Anahef, the former with hills of sandstone and diabase, and the latter strewn with *débris* and mamelons of granite, quartz, mica-schist, and gneiss.

M. Foureau's investigations have shown him that the divide between the Atlantic and Mediterranean drainage is along this plateau of Adrar, considerably further south than has hitherto been supposed, and thus the Wad Afara and other valleys south of the Tassili escarpment drain to the north instead of to the south. From Anahef southwards to the mountains of Aïr stretches the great desolate plain of Tiniri, almost entirely covered with blocks of granite, crossed by some low rounded granite hills, and destitute of all vegetation. Aïr is a somewhat confused mass of chains, with a varying orientation, largely composed of granite and gneiss, the average height of the plateau being about 2000 feet, the crests of the main ranges 1500 feet above that level, and the chief peaks as much as 5800 feet, their sharp outlines showing evidence of great erosion.

The question of the drainage of Aïr is not yet completely worked out. Are its wadis all affluents of Tafassasset, the great artery of the Atlantic system? M. Foureau does not think this likely, but reserves opinion till further investigation has been made. It is always extremely difficult to trace out the courses of the rivers after they leave the mountains and open out on the plains, and this is especially so in Aïr, and the present mission did not pursue these thalwegs far enough to decide their ultimate destination. With regard to the upper course of the great Wadi Tafassasset, M. Foureau confirms, with a few minor exceptions, the opinion of Duveyrier—the first to map this region in any detail—as to the position of the three large branches which join at Assiu, taking thence a direction south-south-west. Having collected the drainage of the southern Sahara, it is presumable that this river, under the name of Tamanghasset, passes west, north of Sokoto to the Niger. But, again, this interesting and important problem remains to be solved. After the floods caused by the infrequent storms of the Sahara, which occur every four or six years, pools of water are left standing for longer or shorter periods, according to the nature of the soil in the beds. The people of the country report that the water remains sometimes for over a year, and that the supply underground in these depressions is practically perennial, existing for three years after a flood. But, as M. Foureau says, these people are "les rois de l'emphase"!

The plateaux of Tagama and Damergu, which terminate the plain of Agades south of Aïr, are flat uninteresting levels of sandstone with clay belts, the clay being covered in parts of Damergu with laterite. Such relief as does exist consists of low lines of hills of granite and quartzite, as those which surround the town of Zinder. There is little more diversity in the country passing from here to Chad, the only rock exposed amongst the sand being laterite. Nearing the lake, the monotony is broken by the two or three lines of woody hills which surround its margin beyond the reed belt, and mark the outside limit of high water-level. M. Foureau does not consider that the fluctuations in the level of the lake are very great, and estimates the extreme difference as 4 feet, while in many years Chad does not reach its highest flood-level, and he has no doubt that, like the other great lakes of the world, it is passing through a period of retrogression owing to a diminution in the general volume of rainfall. He finds no evidence to support the theory advanced by Nachtigal that Chad is shifting towards the north and west; in fact, M. Foureau travelled round the lake with the map made by Barth fifty years ago in his hand, and found every curve and bend of the shore-line exactly as

then delineated. Further, the little fishing villages on the western bank are the same distance from the water as indicated by the latter traveller, and have occupied the same position from the times of the earliest European explorers. The eastern shores of Lake Chad are, as M. Foureau observed, higher than those on the west by 40 feet or so, indicating that the general slope of the plateau is from east to west, and if, as he is fully convinced, this has always been so, the stream of the now dry Bahr-el-Ghazal must have drained into, not out of, the lake. On this disputed question, therefore, M. Foureau again joins issue with Nachtigal, who held, on the contrary, that the original drainage of the country was northwards, but a rapid rising of the land in its northern part had changed the direction—a contention rather subversive of his other theory of the advance of Chad to the north!

The course of the upper Shari is not yet fully established. M. Foureau's observations lead him to agree with those who consider the Bahr Sara the true headwaters of that river, and not the Gribingi or Bamingi, for, though the latter flow in the same direction as the Shari after the confluence, the former is about 60 miles longer, and, coming from a region of heavier rainfall than, for example, the steppes, which the Bamingi traverses, brings down a greater volume of water. The banks of the Shari and Gribingi are sandy, with hard clay or laterite interbedded, usually horizontal, but sometimes tilted till the latter rock is exposed at the surface, a fact that may be noticed at once by the absence of vegetation due to the lack of soil. The clays are formed by the decomposition of the underlying granite, and a series of low granite hills approach the river-banks, while the same rock causes frequent rapids in the stream.

It will be seen that sedimentary rocks play but a small part in that region of the Sahara traversed by the Foureau-Lamy mission. They are almost confined to siliceous sandstones of two types. One of Devonian age, found in the north in Tassili, with a great quantity of quartz and very metalliferous, and the other of uncertain age and more homogeneous in composition, found in Tagama and Damergu. Crystalline rocks cover the greater part of the country from Tassili to Chad, and these belong to many types, from the most acid (mica-schists, etc.) to the basic (gneiss, hornblende, etc.).

Vegetation and Cultivation.

We find in these "documents" some interesting facts about the distribution of vegetation in the Sahara. In the sandy desert the amount of plant-life is greatest on the slopes of the dunes exposed to the east, while the density of vegetation is in inverse ratio to the number of valleys and depressions. Unbroken compact dunes are well clothed with scrub on their lower slopes; but among the more broken sandhills, where the depressions serve to drain off the moisture, the vegetation is only in patches. It is interesting to note that, though as a rule the higher parts of the dunes are bare, there is a small region in the north of Erg Issawan where they are covered with vegetation to their summits. On the rocky plateau the scanty growth is confined to the river-courses, and it is not till the plain of Agades, south of Aïr, is reached that trees begin to be generally distributed over the country. The vegetation in Aïr is indeed richer and taller than in Tinghert or Tassili, owing to the amount of soil brought down by the rivers, which covers the "thalweg" and preserves some underground water. The *Acacia arabica* appears here for the first time, and is the best and largest of the various gum-trees of Aïr. But it is when general cultivation becomes possible that the scene really changes, and the true desert appearance is lost. This is in

Damergu, which not only supplies its own comparatively dense population, but is also the granary of Aïr, and even sends grain to Ghat. Millet and sorghum are cultivated over a large portion of the surface, and where pools of water occur cotton is planted. The above two cereals form the chief crops in Bornu also, and though a little wheat and barley is grown, it is not important. Date palms are cultivated in the more favourable spots, and round Zinder yield two crops a year. Near Chad the baobab, which becomes important on the great savanas of the Shari plateau, first appears, though here only a dwarf species.

Inhabitants.

M. Foureau gives a minute account of all he has observed and gathered with regard to the people of the Sahara, but his remarks are, as he says, more of the nature of detached notes than a connected story. It is difficult, therefore, to single out any particular points in these interesting descriptions, but they illustrate clearly the fact that, though a certain difficulty of living will induce energy and enterprise, and have a beneficial effect on character, there is a line beyond which the struggle for existence is too hard to allow any such development. This is the conditions of the Tuaregs of the north—a life of misery and frequent and always possible starvation; at the best a diet of milk and such grasses as exist in the sand, as well as a state of constant "offence and defence" as regards other groups of people. But in Aïr the richer vegetation, allowing the keeping of cows and some horses (as well as goats and camels), and the possibility of a small amount of cultivation, added to the nearness of the grain market of Damergu, make life a better thing, and there is some definite organization. A regular "transhumance" takes place between Aïr and Damergu, which takes on something of commercial character. The Tuaregs move south from Aïr for the dry season in June and July, taking with them the salt from Bilma which they have collected for the purpose, for distribution in the Sudan, and bringing back on their return for the wet season to Aïr in November, the wheat, rice, and other commodities of the south.

Reviewing the possibilities of development in the Sahara, M. Foureau gives a decided opinion that very little more can be done, even in the south, in the way of agriculture. The yield of the crops could doubtless be increased in Damergou, but millet and sorghum are the only grains that can be grown, and these will not bear long transportation, and therefore a surplus production beyond the needs of the inhabitants would be of no use. But in the development of its mineral potentialities may lie a rich future for the desert, and M. Foureau considers it quite worth while for France to undertake the work of systematic prospecting.

REVIEWS.

ASIA.

The Malay Peninsula.

'Die Inlandstämme der Malayischen Halbinsel.' Von Dr. Rudolf Martin. Jena: G. Fischer. 1905.

This monumental work marks, or perhaps one should say makes, an epoch in the study of the subject to which it is devoted. What has hitherto been written about the wild tribes of the Malay Peninsula amounts, indeed, to a considerable bulk; but most of it lies scattered through the back numbers of various periodical publications

and in casual notices contained in books of travel, and the like, so that it is not easily accessible. Here we have the first attempt ever made to put together in monograph form an adequate account of these races, based partly on a critical survey of the older authorities, partly on the writer's own observations made during a journey specially undertaken for that purpose.

The point of view is in the main anthropological, and a large part of the work consists of a detailed analysis and comparison of measurements made upon the bodies of representative individuals and the rather limited number of skulls and skeletons available. But this is by no means all; the technically anthropological part is preceded by a section dealing briefly with the geography, geology, climatology, flora, fauna, prehistoric remains, and historic development of the peninsula (this last being traced in outline from the earliest times to the present day). The progress of exploration and research in relation to these tribes is then reviewed in detail, the various names under which they have been known are discussed, and the geographical distribution of the tribes is explained. Though here and there subject to correction in matters of secondary importance, this part of the work has been very well done, and displays exceptional mastery of the subject. It has evidently involved a vast amount of research, for the authorities referred to are very numerous, and often of a very special and out-of-the-way character.

The third section of the book deals, under the name of "Ergologie," with the mode of life of these aborigines. Their dwellings, clothing and ornaments, food-supply, methods of hunting, tools and utensils, decorative art, social organization, habits and customs, religious beliefs and superstitions receive detailed and critical treatment. There is also a short chapter on their languages. Particularly good is the account of their decorative art, a subject which has hitherto been much misunderstood. A previous explorer, misled apparently by his own preconceptions and his inadequate knowledge of the vernacular, had evolved a most elaborate symbolic explanation of the designs with which these simple savages decorate their various utensils; the author of the work now under review does good service in showing the baselessness of the whole theory. The fact is that these tribes are amongst the most primitive specimens of the human race. Living as they do in a country of thick and almost impenetrable forests (a circumstance to which, without doubt, they owe their survival, in spite of the stronger races that surround them), they are still, for the most part, in what may be called the Bamboo Age. Most of their utensils are made (and very ingeniously made) from this and other trees. Such pottery and metal tools as they possess have been acquired by barter from surrounding races of higher development, and, although neolithic tools have been found in the peninsula in considerable numbers, it is very doubtful whether they were made or even used by the ancestors of these wild tribes. Their whole social organization and mode of life testify to their simplicity of character—a simplicity which is accompanied by honesty, gentleness, and a high standard of morality in general, that have called forth the sympathetic comments of every European traveller who has come into contact with them.

The work closes with a chapter summarizing the conclusions at which the author arrives. Briefly, there are three distinct types among the aborigines here dealt with. In the north of the peninsula the woolly-haired Negritos, in the south a straight-haired type representing a primitive Malayan race, and, most important of all, in the centre a wavy-haired race bearing a considerable resemblance to the Veddas of Ceylon, the Toálas of Celebes, and a number of more or less uncivilized tribes in Central and Eastern Indo-China. In most of the extensive literature relating to the subject, these types have hitherto been hopelessly jumbled up together; even the most recent works, *e.g.* Annandale and Robinson's 'Fasciculi

Malayenses' (not to mention popular works such as 'Living Races of Mankind'), fail to distinguish the wavy-haired type from the other two, or treat it as a cross between the Negrito and some other race. It is the peculiar merit of the present work that it definitely establishes the independent existence of this type, and foreshadows the probability that it may eventually be linked up with other dispersed fragments of a similar type in India and Ceylon, Indo-China, and the Eastern Archipelago.

There are still plenty of knotty points left to unravel. How is it, for instance, that the Negritos and the wavy-haired Sakai (or Sĕnoi, as the author prefers to call them), though distinct races inhabiting different but adjoining districts, nevertheless speak dialects of a common tongue, and one that has its nearest allies right in the heart of Southern Indo-China? The author does not profess to deal with the linguistic problems which these tribes present, and some of his "ergological" conclusions may require to be reconsidered in the light of the linguistic evidence. For instance, his contention that the primitive agriculture practised by some of these tribes has been borrowed from their Malay neighbours, cannot be reconciled with the fact that some of the words relating thereto are of undoubtedly Indo-Chinese affinity.

The book contains a very full bibliography, and, though it has no index, the want of one is to some extent made good by a very detailed table of contents. The illustrations, nearly all from the author's own photographs, are numerous and of really superlative excellence; and altogether the book is a first-rate piece of work.

C. O. Blagden.

AUSTRALASIA.

Central Australia.

'The Dead Heart of Australia.' A journey around Lake Eyre in the summer of 1901–1902, with some account of the Lake Eyre basin and the flowing wells of Central Australia. By J. W. Gregory, F.R.S., D.Sc., Professor of Geology in the University of Glasgow. *With Maps and Illustrations.* London: John Murray. 1906.

A new book by the author of the 'Great Rift Valley' will be opened with pleasurable expectation as certain to be interesting and suggestive. Prof. Gregory's present volume is an account of a recent expedition in a region far from his previous successful explorations in East Africa. It deals with a journey, conducted with characteristic ardour, into Central Australia to the region round Lake Eyre, during the hot season of 1901–02—a very difficult period of the year for exploration, but the only one the members had free from University engagements. The expedition was undertaken in company with Mr. Grayson, Prof. Gregory's assistant, and several students of geology of Melbourne University (in which at that time the author held the chair of Geology), in the hope that it would be the first of a series for the study of South-Eastern Australia. We may trust that, although Dr. Gregory has been translated to the University of Glasgow, the projected expeditions may not be discontinued, but that his successors may from time to time have to present us with as successful a record of work as is the book now under notice.

It was the narration of the native legend of the Kadimakara, told to our impressionable author by Dr. Howitt, the distinguished Australian anthropologist, that fired his spirit and was the direct cause of the expedition. These Kadimakara were strange monsters which once on a time lived on the roof of vegetation upholding the sky which then covered Central Australia. The sweet scent of the earth and its pastures would often tempt them down from their bowery home, till on an evil day it befell that their retreat was cut off by the destruction of the

mighty pillared gum trees of the sky, when "they were obliged to roam on earth and wallow in the marshes of Lake Eyre till they died, and to this day their bones lie where they fell"—to prove the truth of the legend. The objects of the expedition to Lake Eyre were, therefore, to secure a collection of the fossil Kadimakara in that area; to determine with greater precision the age at which these giant marsupials lived there; to gain further information as to the geological history of Central Australia, and to see what light geology could throw on the legends and original home of the aborigines.

Following an introductory chapter, Part ii. contains the "Narrative" of the journey, which began in earnest only at Hergott Springs, a station on the Great Northern railway, some 440 miles north of Adelaide, where a caravan of nine camels was in readiness for them. Their route lay at first north-westerly to Lake Kopperamanna, on Cooper's creek, across the Stony desert. "The Stony desert is due to the absence of water," and is not an old sea-floor, as was at one time supposed. "The country where it occurs was once covered with a sheet of the rock known as Desert Sandstone, in which there are abundant pebbles of quartz, sandstone, and other hard materials. The Desert Sandstone has slowly decayed under the action of the weather, the loose sandstone has been blown away by the wind, and the hard fragments remain scattered over the ground," "sometimes so closely packed that a cart leaves no wheel-ruts." From Kopperamanna the expedition travelled westwards down the creek to Lake Eyre, studying the geology and geography of the country and searching for fossil Kadimakara. Dr. Gregory notes the very interesting fact of the extraordinary abundance of old stone flakes, scrapers, and quartzite chips littered over the ground on the Cooper flats, dropped, for want of pockets, by the Dieri tribe with "the same extravagant untidiness as are the palæolithic flakes in some English gravels." This stage of their journey occupied over a week, and was full of "experiences"—if not of the adventurous order, yet trying enough—of land-storms, "big-fellow hot" days, and dearth of water. In the creek-bed and in the loams of its banks a considerable number of fossils was obtained; but their search was entirely unrewarded in the "lake," where "not even with the telescope" could they "detect any sign of water." Returning upon their route as far as Markoni, where they had a base-camp, their next stage lay north across the Tirari desert, 50 miles of waterless sandhill country to Kalamurina, in the Diamantina valley. Along their route to the river the native vegetation was all dead, and there was little to observe and less to collect. From Kalamurina they carried their quest eastward for some distance with moderate success, then back westward down the valley through scenery which one hardly expects to hear of—"full of variety and often beautiful," "with fine views of long serpentine reaches of salt water," full of swarms of birds—to the northern end of Lake Eyre. Thence a hundred miles of trackless, waterless wild had to be crossed to Warina, on the western side of Lake Eyre, where they had to catch the train for Adelaide which passed there once a fortnight. Notwithstanding various time-consuming disasters, dust- and rain-storms, the sagacious leader brought his expedition safely to the railway with seven hours to spare, having thrown into the programme an attendance at a corroboree through the small hours of one night.

Part iii. deals with "The Lake Eyre Basin," which has played so important a part in the botany, zoology, and anthropology of Australia. Once "a fertile and creative region," it has now become barren and inert. Its geological history is traced from Palæozoic times, during which, by subsidence of the land, a great central sea extended from the Gulf of Carpentaria through West Queensland over the northern region of South Australia; this sea, subsequently retreating, exposed the marine deposits overlaid by sand, loams, and gravels, whose disintegration now forms the

Desert Sandstone. The elevation of Queensland followed, and the subsidence of the coast lands of South Australia and Victoria, while a double set of parallel faults across Southern Australia produced its great Rift Valley. A second subsidence of the Lake Eyre region produced a vast inland fresh-water sea three times its present size, whose waters and shores harboured the now extinct great marsupials, the crocodiles and the mud-fish (*Ceratodus*), whose bones now lie within the area. Finally, the rainfall dwindled, the lake decreased till its margin is now nearly 40 feet below sea-level, and became so salt that the vegetation withered and all the land and water animals died, and "the fertile basin of Lake Eyre was blasted into desert"—now the "dead heart of Australia." Prof. Gregory argues, from his study of the fossil remains, that probably the great climatic changes on Lake Eyre occurred after the introduction of the dingo and before the advent of man to this region; and since the remains of the dingo were found in association with those of the *Thylacinus*, which is known now only from Tasmania, it is probable "that Bass strait was formed after the development of *Thylacinus* and before the arrival of the dingo," "that there is considerable evidence to show that the older marsupial beds of Lake Eyre belong to the Pliocene;" and the age of the desiccation of Central Australia began . . . in . . . the Pleistocene."

An interesting chapter is devoted to the aborigines of the Lake Eyre region, in regard to whom the author's conclusions will probably not meet with entire acceptance. He strenuously fights for his "black brother" against the widespread belief that they are the most depraved members of the human family. He calls various distinguished authorities as witnesses on his side—Pickering, on behalf of their being "the finest models of the human proportions;" Huxley, that they are not negroes, but nearly related to the ancient Egyptians and the hill tribes of the Dekkan; and Spencer and Gillen, that they are a generous and kindly people. He asserts there is little evidence for their mental degradation, and that they have a real belief "in the immortality of their souls and in the existence of a spiritual world." In regard to moral character and religious beliefs, much depends on the interpreter of the ideas of the aborigines. Dr. Gregory's opinions must always carry great weight; but one cannot help thinking that here they are somewhat kindly prejudiced by his favourable experience in finding those natives he met with (who appear to have been select specimens with a considerable experience of whites and civilization) so much better than his fancy (founded on the reports of others) had painted them. In regard to their religious beliefs, Howitt states that their interpretation has often been built up on a "superstructure which represents Christian dogmas." He asserts that the aborigines "do not recognize any divinity, good or evil." All natives believe more or less in spirits, from the very fact of their seeing dead or living friends in their dreams. As to their mental attainments, in the present writer's own experience, and that of several competent born-Australians communicated to him, they are lower than those of Negroes or Papuans. Has any aboriginal ever approached the mental attainments of the Crowthers (the father a bishop, and his son an archdeacon), of senators and congressmen in America, or of many of the administrators in Liberia? Brough Smyth, Dr. Lumholtz, and Dr. Semon, to mention only a few who speak with first-hand knowledge, have recorded much that must be placed to the *contra* account. Dr. Gregory further has become convinced that the Australian aborigines are Caucasians. He cites Mr. Lydekker as of the same opinion. If our memory serves us, however, we think that this anthropologist has not committed himself to this view. It seems to us that, whether the Australian be a Negro or not, it does violence to one's classificatory sense to group him with his white fellow-countryman as a Caucasian. In the physical characters of palate, prognathous jaws, nasal notch, thick lips,

spinal curvatures, form of pelvis, cranial capacity, and brain itself, the Australian differs greatly from those to whom the term Caucasian has been applied. The straight hair of the aborigines, and their hirsuteness of body, however acquired, which are their specially Caucasian characters, do not counterbalance the number of non-Caucasian—mostly negroid—characters they possess. The straight hair, moreover, is not universal among them. The present writer has seen abundant examples of frizzly-haired natives with naked bodies in Northern Queensland as far south as Cooktown and Townsville. He has before him a photographic group of New South Wales aborigines, in which the cranial hair *appears* to be as frizzled as that of any Tasmanian or Banks islander. It is unquestionable that in many cases the Australian profile (cf. plate facing p. 164, lower left-hand figure) is not very dissimilar from that of some Caucasians; but close study of the shape of the head and contour of the forehead discloses to the eye differences, not easily expressed in words, demarking the Australian from the Caucasian physiognomy. In New Guinea and New Zealand the writer has seen faces of undoubted Papuans and Maoris that would, but for their colour, have passed for Europeans. This occurs among all races. The sum of the characters of the Australian aborigines, however, is more negroid than Caucasian. It is not improbable that his pedigree may lie near to that of the Neanderthal, Cro magnon, and Grimaldi races, on the undifferentiated stock of mankind.

It is impossible, in the space at our disposal, to discuss the author's observations on exogamy, totemism, and marriage rules, except to say that we do not seem yet to have reached any satisfying explanation of the origin of either exogamy or totemism. Would a people in the primitive savage condition trouble themselves whether inbreeding were injurious or not, or incest were immoral? Or would they be capable of detecting cause of the harm if the custom were injurious, when the highly civilized Egyptian monarchs who wedded their sisters failed to discover the fact? In this section of the book we have a most interesting account of the corroboree that the party witnessed at the Peak to the north-west of Lake Eyre. This form of corroboree had, it seems, *only just arrived in that region*, having been invented in Northern Queensland some years previously, and gradually migrated south and west. This interesting fact will cause the investigator of Australian customs to ask, Is there any certainty that the present corroboree ceremonies are of any high antiquity? Have they any real motive or significance beyond amusement? And is it possible to eliminate the old from the new formulæ? Chapters full of interest are devoted to geography and myths, in which the author tries to eliminate from the myths the past condition of the country; the origin of the people, who, he concludes, are probably immigrants from a tropical forest country to the north; to the geographical plan of South Australia; and to the story of the discovery and exploration of Lake Eyre.

The fourth and concluding Part discusses the chances of the revival of the Heart of Australia, now dead for lack of water, but which, with its nutrient soil, might be a fertile garden. The tapping of the colossal reservoirs under East Central Australia, so far as irrigating the soil, has been a failure. Its main result—no small one, however—has been to enable stock to be conveyed from the east coast with safety across the central waterless plains to the southern coast. It has been suggested to flood the great central basin of Lake Eyre from the Indian ocean, so as to produce a humid atmosphere, and thus stimulate vegetation, which would increase the rainfall, while the change in vegetation would secure more effective use of the rain that would fall in the region, at all events round—though perhaps not very far round—the inland sea. The expense of this project is its only drawback; and this is likely to be overcome only, as the author grimly remarks, "if the land were stocked with

the sheep that grew the golden fleece." A timely and serious warning, also, is given by the author as to the probable failure of the subterranean reservoirs, which, at present, are allowed to discharge uncontrolled thousands of gallons an hour throughout the year.

This volume, which, as we have already remarked, is very interesting and broaches many difficult problems, is well printed, beautifully illustrated with views taken during the expedition, and furnished with several maps. The index of subjects is perhaps not as full as it might be, while some of the places referred to in the text are omitted from the maps.

H. O. F.

THE MONTHLY RECORD.

ASIA.

The Shanghai-Nanking Railway.—The new railway just opened (on July 18) in China traverses a fertile and populous tract of alluvial country in the province of Kiangsu. It runs for a distance of about 200 miles from Shanghai to Nanking in a generally north-westerly direction through the towns of Su-chou, Wu-sieh, and Chin-kiang. The section actually opened to traffic, however, is from Shanghai to Su-chou and Wu-sieh, a total distance of 85 miles. The remaining portion to Chin-kiang and Nanking enters into more hilly country, where some tunnelling is necessary, and this, it is anticipated, will not be completed and opened for traffic until 1908. The country round about is one of the most thickly inhabited and productive parts of China. It is intersected with numerous creeks, canals, and tributary streams draining into the Su-chou creek, the Hwang Pu river, and the Yang-tse Kiang. Cotton, rice, and mulberry trees are grown extensively, and there is a great passenger traffic along the Grand canal, as well as endless junks freighted with timber, stone, grain, pottery, bamboos, and miscellaneous goods. The length of time occupied by passengers in travelling from Shanghai to Nanking will be reduced from about twenty-eight hours to eight or ten hours, and the goods traffic, which now occupies several days, will gain in an even greater degree. Su-chou and Chin-kiang, in addition, of course, to Shanghai and Nanking, the termini of the line, are treaty ports. The first named has been called the Venice of the Far East, owing to the network of canals that pass through its curious narrow streets. It was besieged by Colonel Gordon during the Taiping rebellion, and is now a great centre of the silk industry. Wu-sieh and Chin-kiang are also busy marts, the latter, as well as Nanking, being a regular calling place for the steamers that ply on the Yang-tse. It may thus be fairly anticipated that the new line will conduce powerfully towards opening up this part of China to European trade and also to travellers, as there is much of interest to be seen in Nanking and the neighbourhood.

The Gold-mines of Formosa.—A British Consular Report (Miscel. Series, No. 649) gives an account of the gold-mines of Formosa. Though the discovery of gold in the island dates from the fifteenth century, the Chinese were not aware of its existence till 1890, and not till after the cession of Formosa to the Japanese was its gold-mining put under government regulation. The output of placer-mining having dwindled from 20,424 ozs. in 1902 to some 3000 in 1905, gold-mining is now practically restricted to quartz mining, the output from which, 18,735 ozs. in 1901, amounted in 1905 to the estimated figure of 62,730 ozs. Whereas, again, the estimated output of gold from the whole of Japan amounted in 1905 to but 95,173 ozs., no notable increase on previous years' outputs, Formosa's output amounted in that year to 66,177 ozs., the culmination of a series of rapid annual increases. Soon,

therefore, the gold-mining of Formosa promises to exceed in value that of the whole of Japan. There are three mines worked in Formosa: Kyufun, Kinkwasek, and Botanko, all contiguous to one another, some 10 miles east of Kelung. Botanko mine, the smallest of the three, is said to contain the richest ore, but its refining plant is at present inadequate. The three mines employ over 2500 men, Japanese and natives.

Statistics of the Tunguses.—Schrenck's account of the Tunguses in the Amur region represents a situation no longer extant, owing to the tide of Russian immigration, which set in about 1858, and has amounted latterly to some 200,000 annually. By 1897 the Russians constituted 86 per cent. of the Amurskaya province, and 51 per cent. of Primorskaya. New postal roads, lines of steamers, and the railway introduced unwonted bustle of life. Large works in docks, ports, on the railway, in mining districts, attracted troops of labourers from China and Korea, while to the fast-developing towns streamed numbers of active Japanese. The weak and scattered savages had thus to yield up one belt of land after another. Till recently the Russians kept to the great rivers and highways, and the natives were left in possession of the waste regions. Now, however, numerous settlements of goldminers, mostly Russian, are to be found in the remotest parts. In many places epidemics and hunger have wiped out the natives, and in many regions where they used to be the only inhabitants, they now constitute but a small percentage of a population composed mostly of Russians, Chinese, and Koreans. With a view to bringing up to date our knowledge of the Tunguses and their distribution, a book by M. S. Patkanov has been published by the Hungarian Committee of the International Association for the Exploration of Central Asia. The author, who took part in the elaboration of the census material of 1897, utilized it for the purpose of elucidating the geography of the Tunguses, while supplementing it by a study of the whole literature of the subject. The present publication (264 pp., 8vo.) constitutes but a part of a larger and yet unpublished work. Having taken stock of the Tunguses, group by group, M. Patkanov, summing up, finds that outside the southern circles of the Yenesei Government and the Primorskaya province, Tunguses are to be met with in greater or less numbers in all parts of Eastern Siberia not claimed by other nationalities. Irrespective of numerous outrunners and ramifications and insular groups, the main body occupies a broad semi-circular belt stretching from the Yenesei to the Okhotsk circle, and attaining its southern extension in the Transbaikal and Amur provinces. In this immense region there live, according to the Census of 1897—which, however, omits three small categories—62,068 Tunguses, of whom 31,375 are males. In the Transbaikal province there are 101 females to 100 males, but in the Amur province and Sakhalin only 77 and 72 females to 100 males. A Tungus household averages 5·5 persons.

AFRICA.

The Turco-Egyptian Frontier.—A parliamentary paper issued in July (Cd. 3006) brings together the facts of importance relative to the question of the frontier between Egypt and Turkey, which earlier in the year created such a grave situation between the latter and Great Britain. Of special interest is the summary of the past relations between Egypt and the Sinai peninsula, which are a matter of some obscurity. A despatch of Lord Cromer's points out that Egypt has, in fact, been in possession of the disputed territory for many centuries, and the starting-point of the frontier on the Mediterranean has always been recognized to be at Rafeh, east of El Arish, which was mentioned as such by the Arab geographer and historian Abulfeda, though his definition of the rest of the frontier seems not quite

so clear as might be wished. In more modern times, the most important documents are the firmans of 1841, confirming Mehemet Ali and his heirs in the possession of the Pashalik, and the map drawn up at the same time, in which, according to the Turkish contention, the eastern frontier of "the privileged Province of Egypt," runs from El Arish to Suez; and the recent attempted encroachments on the part of Turkey have been founded on this fact. The hold of Egypt on the territory east of that line had, however, been strengthened early in the nineteenth century by the services of Mehemet Ali and his son Ibrahim Pasha in suppressing the Wahabi rebellion, whereby they saved Arabia for the Sultan; and this was recognized in 1841 by the definite grant of the Administration of Sinai to the Egyptian ruler. Nor was the claim of Egypt ever questioned until the accession of the present Khedive in 1892, when the Firman of Investiture was so worded as to appear to exclude the Sinai peninsula from Egyptian influence. The matter was then settled in favour of Egypt by a telegram from the Grand Vizier to the Khedive, dated April 8, 1892, which recognized the maintenance of the *status quo* in the peninsula, though replacing under Turkish rule certain posts previously garrisoned by Egypt on the eastern side of the Gulf of Akaba. In the recent dispute the validity of this telegram was allowed by the Sultan, but an unjustifiable attempt was made to limit the Sinai peninsula by a line running direct from Akaba to Suez, all the area north of this and east of a line from Suez to El Arish being claimed by Turkey, with the offer of an alternative line running south from El Arish to Ras Mohammed, the southernmost point of the peninsula. The line eventually obtained by Egypt, and to be delimited by a mixed commission, is that running from a point not less than 3 miles west of Akaba to Rafeh. The immediate cause of the difficulty had been the strengthening of the administrative hold of Egypt over the peninsula last year, owing to ferment among the tribes, in which Turkey professed to see ulterior designs of an aggressive nature.

The Forest Districts of Uganda.—An interesting journey of inspection through all the most important forest areas of the Uganda protectorate has lately been made by Mr. M. T. Dawe, officer in charge of the Forestry and Scientific Department, who gives the results of his observations in a parliamentary paper issued in April last (Cd. 2904). The largest forests (as shown in a sketch-map accompanying the report) lie along two strips of country, one running near the west and north-west shores of the Victoria Nyanza, the other following a more or less parallel line through the extreme west of the protectorate. Mr. Dawe describes each forest in turn, and though his point of view is mainly economic, and less is said than might be wished on the ecological side of the subject, many details of geographical interest can be gleaned from the report. An important discovery was that of the Lagos silk rubber tree (*Funtumia elastica*) as an indigenous element, while several new species of *Landolphia*, some of economic importance, were also brought to light. Of the first forests visited, that of Bujeju in Buddu occupies a low-lying tract near the lake, some parts of which seem once to have formed part of the latter. The forest seems comparatively new, and to be gradually encroaching on the interior plains. It contains no good rubber-vines, though they are found in adjoining areas. One of the trees found in this district, though not of large size, is a variety of the valuable *Podocarpus milanjianus*, which occurs practically on the lake-shore. Of the western forests, that of western Ankole occupies a large area east of Lake Albert Edward. It is largely composed of three trees—*Carapa grandiflora*, *Symphonia globulifera*, and *Parinarium excelsum*. Mr. Dawe remarks that almost every forest in Uganda possesses its own special character, due to the predominance of one or two particular trees. In Toro, the Kibale forest covers a considerable area. The most common tree is one nearly allied to *Maba abyssinica*, with ebony-like markings in the centre. An interesting

tree with resinous bark and a timber much resembling sandal-wood proved to be unknown, and has been placed in a new genus (*Dawea*), as well as in a new tribe of *Bixineæ*. To the south this forest touches the northern end of Lake Ruisamba (or Kyanja, as Mr. Dawe heard it named exclusively). An account is given of the types of vegetation on the Ruwenzori range, agreeing generally with those of previous travellers, though more detailed as regards species met with. Here, too, the *Podocarpus milanjianus* occurs. The tree-*Senecio* growing near the lower glaciers proved to be a new species, which has been named *adnivalis*. From the point reached near the base of the glacier no snow was visible (in July), and Mr. Dawe concludes that there are much colder seasons. The country comprising the Semliki plains, with the Ruwenzori and Mboga ranges on either side, is described as one of the finest districts for cultivation in the protectorate, the hot Semliki valley being especially adapted for tropical products,* such as Para rubber. The climate of the Mboga hills seems more bracing than that of Ruwenzori. In the Semliki forest (which is largely composed of *Cynometra*), the oil palm of West Africa is found, and is said to be abundant in certain localities. The Bwamba of this region are very destructive to forest land, as they are constantly making new clearings. In the Bugoma forest of Unyoro the *Cynometra Alexandri* is again abundant, and where this is the case there is little rubber. Further north, the Budongo forest is said to cover an area of 350 square miles. It is well watered. The growth of trees is very dense, and it is certainly the most valuable timber forest seen in the protectorate, the most important trees belonging to the mahogany order. Unyoro is regarded by Mr. Dawe as offering great possibilities for agriculture, and as admirably adapted for cotton so far as the soil is concerned. The statement that plaintains form the staple food of the people is erroneous.

Economic Condition and Resources of Abyssinia.—On the basis of first-hand observations made during a recent German embassy to Abyssinia, which resulted in the conclusion of a commercial treaty between Germany and Abyssinia, the official *Berichte über Handel u. Industrie* (vol. 9, No. 1) gives a well-digested and all-round appreciation of the actual economic condition and resources of the land. It comprehends an account of such economic factors as soil, climate, population, language, branches of industry, communications with and within the country, waterways, caravan freights, customs, post, currency, bank, exports, and imports. A sketch-map is appended. Of excellent natural resources, Abyssinia is as yet very imperfectly developed. Exceeding in area the German Empire, it has a population of but 9 to 11 millions at the most. Almost everywhere is a good layer of humus, and regular rains supply needed moisture. But by regular burning in the dry season, natural forest and grassy steppe-lands are being converted into desert. Of an average elevation of 6500 to 8000 feet, Abyssinia grows barley to a height of 10,000 feet. The lowlying lands (*kolla*), now mostly desert, are still in large part capable of cultivation if irrigated. There is, however, no provision for saving the water even at the most frequented wells. In almost all parts of the plateau there is a uniformly excellent climate, fresh mountain air, constantly cool nights, and no malaria, such as render residence under normal conditions possible to any European nation. What might be made of Abyssinia at large is exampled in the present comparatively very flourishing colony of Eritrea. Besides the native population—Abyssinians proper, Semitic; Hamitic Gallas and Somalis; Negroes (*Shankala*) in south-west; and Falasha (Jews)—there are in Abyssinia Indians, Arabs, Greeks, and Armenians, as also a few Europeans in Adis Abeba and Harrar. Except Harrar, of Arabic origin, there are

* Mr. Dawe says "extra-tropical," but as he elsewhere contrasts this term with "subtropical" and "temperate," its use would seem to be an error.

no towns proper, but only collections of straw-thatched huts, with no connecting streets nor shops. Trade is confined to weekly markets. The Saturday market of Adis Abeba is thronged by 30,000 to 50,000 people. But outside the market there is not a shop, and on other days than Saturdays the market-place is empty. With its exuberant meadows and excellent climate, Abyssinia lends itself to cattle-rearing, which is the most general industry, flesh being the main food, and little as is the care bestowed on them, you meet many strikingly fine cattle. Sheep and goats are everywhere. The land is capable of producing endless wealth of wool, but the actual stock of sheep and goats is very inferior. Next to cattle-rearing comes agriculture. In the higher regions the soil is of extraordinary fertility, yielding, in parts, a treble harvest yearly. But agriculture is in the most primitive stage imaginable. There is very little terrace-building or irrigation, and implements in some places are only of wood or stone. Abyssinia is one of the Arcadian lands that may still claim immunity from over-specialization of industry. It has no millers, for its corn is ground between stones at home; no bakers, for its bread is baked at home; no weavers, for its cotton cloth is woven at home; no tailors, for its scanty wardrobe is pieced together at home; no shoemakers, for its people go barefoot; no smiths, for its horses go unshod.

Nomadism in Algeria.—An article in the *Annales de Géographie* (15th year, No. 80), by MM. Augustin Bernard and N. Lacroix, setting forth the history and present position of nomadism in Algeria, supplies incidentally a useful contribution to the general question of the relations between nomadic and settled life. A part of the native population of Barbary has always led a pastoral life. During the three centuries of Roman dominion nomadism had to yield ground in favour of agriculture. But from the fifth century the natives returned to their ancient condition. Anarchy and war loosened from the soil the population imperfectly attached to it in the preceding period. The devastation was intensified when in the eleventh century the Arabs, like a cloud of locusts, swooped on North Africa. Their sheep, camels, and goats ate up the country. The Turks aggravated the mischief. Altogether there have always existed in North Africa both nomadic and settled populations, because there are regions there lending themselves, some to settled, some to nomadic life. But at the junction of the two zones districts have vacillated between the two forms. Whether a particular region will be nomadic or settled is an affair of climate influenced by history. Since 1830 deforestation has advanced more rapidly than ever, and that in regions such as the littoral belt of the cork tree in Constantine department, most favourable to the growth of trees. Forest gives way to underwood, underwood to grass, grass to bare soil. French domination has penetrated to the wooded regions, whither colonization and their habits have driven the natives. Access to the forest is for cattle at certain places and periods a question of life, as for the forest itself it is often a question of death. The article proceeds to treat of the mutual adjustment of forest and pasture, showing how, as the settled natives recede before civilization from the better to the inferior lands, the area of culture extends, and next of the mutual adjustment of tillage and pasture, a problem which awaits the conclusion of an official inquiry, the results of which will be summed up in a map of the pasturages. It also discusses the distribution of ox, camel, and sheep; the amelioration of pasture lands by irrigation; growing restriction of the area of pasture; the economic value of nomadism, and other similar questions.

AMERICA.

Indian Affairs in Canada.—The Annual Report on Indian Affairs in Canada for year ending June 30, 1905, which bulks as a Blue Book of 452 pages

of text and 167 pages of appended tables, gives a detailed account of the varied conditions of Indian life, which are summed up, not quite so systematically as might be wished, in an introductory section. The population, including the long unrevised figures of population outside Treaty Limits, reached a total of 107,854, an increase of 316 over the population of 1904. The births were 2699—273 in excess of the deaths, or 11 more than in 1903–4. The high death-rate, attributed chiefly to the "white plague," is, under the gradual improvement in food, clothing, and housing, etc., somewhat abating. The low-roofed cabin of logs, with mud floor, hole in centre for fireplace, opening in roof for outlet of smoke, in some cases no opening at all to serve as window, is yet an advance on the nomadic wigwam. Thanks to industrial schools, Indian dwellings are now to be found not only passable economically, but indicating a tendency towards attractiveness. Withal, however, the appreciation of light, ventilation, and partitionment in Indian domestic arrangements develops at a slow pace. As regards agriculture, more propitious than less stable industries to Indian civilization, the 44,196 acres under cultivation in 1905 produced 1,264,705 bushels of grain and roots, a slight decrease on 1904. Horned stock and horses both showed increases in 1905 on the previous year. Ontario shows far the largest farming acreage and produce, but the North-West Territories have one and a quarter times the aggregate horned stock held by Indians in all the rest of Canada. A considerable source of revenue, particularly in the eastern provinces, is the manufacture, mostly by women, of native wares and fancy work. Along the British Columbian coast the Indians engage largely in salt-water fishing. The fishing staple, however, is salmon, which yields the Indians food, not only directly, but indirectly through the canning industry, the men catching the salmon, and the women cutting up and cleaning them for the factories.

AUSTRALASIA AND PACIFIC ISLANDS.

Journey across Viti Levu.—Sir Everard Im Thurn, Governor of Fiji, made an interesting journey last November across the mountainous interior of Viti Levu, from the mouth of the Sigatoka river on the one side to Ba on the opposite coast. The coast at the river-mouth is unprotected by a reef, and the big ocean waves, locally called *lokas*, continually roll in, making the narrow rocky entrance precarious even for small boats, and piling up the great swelling sand-dunes characteristic of this part of Fiji only. An entrance was, however, successfully made in the steam-launch of the *Ranadi*, perhaps the first steam-craft to enter the river. After presiding at the installation of a new Roko, or native chief, the governor and his party proceeded along the bridle-road which crosses the flats of the Sigatoka and winds over the rugged interior ranges. The flats, which extend up to Fort Carnarvon, seem capable of great development agriculturally. The route led through the scenes of the war of 1876, in which Sir Arthur Gordon finally ended the long strife waged by the mountain tribes against the coast natives and Europeans. On the present occasion the travellers met everywhere with a most hospitable reception, and the outer hills struck the governor as offering great opportunities for sheep-rearing, if the native system of firing the whole country-side in search of wild yams were stopped. Further on the Nalotu range, with a wonderfully serrated crest of dolomitic rock, was crossed by a small but well-marked nick in the knife-edge, the steep descent leading through thick trees to the flats along the Ba river. On this, the north-west side of the island, is the great sugar estate of the Colonial Sugar Refining Company, extending some 40 miles between the Ba and Nadi rivers, the capabilities of which considerably impressed the governor. At one of the more recently opened centres, Lautoka, the mill is one of the most up-to-date in the world, and the place has also the advantage of possessing sheltered anchorage and an excellent wharf. What is

wanted, however, is the connection of its tram system with that at the other end of the estate. An interesting experiment in the reclamation of coast swamp-land has lately been made, the great difficulty being the washing of the salt out of the soil. From Ba the governor rode up by the excellent bridle-path to Nadarivatu (which it is hoped to develop as a sanatorium), through some of the finest mountain scenery imaginable. Sir Everard expresses the hope that this track may before long be made passable at least for bullock-waggons.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Cold Water on the West Coast of the United States.—The west coast of the United States, like many other continental coast-lines, especially on the west side, is marked by the belt of abnormally cold water lying along it, and usually explained (as, *e.g.*, by Mr. J. Y. Buchanan, in *Proc. R.G.S.*, December, 1886) as due to upwelling of cold water from the depths when the surface water is blown away from the coast by off-shore winds. Mr. R. S. Holway has lately examined the particular case referred to in the *University of California Publications*, Geology, vol. 4, No. 13, 1905, and comes to the conclusion that the above explanation is incorrect in this instance. Previous authorities have, he says, been mistaken, both in extending the cold-water belt southward to the coast of Lower California, and in supposing that trade winds blowing off-shore are associated with the occurrence of the said cold water. He points out that the pilot charts show, at all seasons of the year, a belt of north-west winds between the southern California coast and the trade winds, and that just where the latter are nearest to the coast is the very locality that fails to show a definite belt of cold coast-water. In order to arrive at a possible explanation, he examines the general temperature conditions of the north-eastern Pacific, laying stress on the fact that the coldest bottom water, as mapped by Sir John Murray, occurs, not at the greatest depths, but on the continental slope. This would be intelligible on the supposition (which he allows to be at present unsupported by sufficient evidence, but which it may be permissible to take as a working hypothesis) that the general surface drift of this part of the ocean also extends to great depths. The distribution of the cold bottom-water shows a close agreement with the direction of such surface drifts, while the fact that the coldest water of all is found off the coast between Capes Blanco and Mendocino is explained, on the above hypothesis, by the submarine contours, which show that a great submarine valley heads just under Cape Blanco, and opens broadly out to the northward and westward. The writer thinks that other points in the temperature distribution of the North Pacific fit in with the idea that the drifts are generally continued from the surface to great depths. He shows that the isotherms at depths of 400 and 700 metres, so far as they can be drawn from available data, give an indication of a south-east flowing portion of the cold Kamchatka current which has underrun the warm Japan stream, and thinks that to this may be due the large area of cold bottom water in the south-central portion of the North Pacific. These are, of course, at present mere suggestions, but they are of interest as pointing out important lines of inquiry in connection with oceanic circulation.

Prof. W. Láska on the Earth's Interior.—Prof. W. Láska, of Lemberg (Galicia), Referee of the Seismological Commission of the Imperial Academy of Sciences in Vienna, has put forward some considerations on the constitution of the Earth's interior, which are all the more interesting inasmuch as they deal with a subject of which there is yet but little definitely known. He takes his point of departure from the investigations of Emil Wiechert (Göttingen) and Dr. J. Milne. Both assume a bipartite interior, and differ only in the mutual relation assigned by them to the two parts crust and core. More particularly in his method of treatment

Prof. Láska supplements the investigations of Milne. Like the latter, he makes use of seismic observations as a basis for his conclusions, but he also puts under contribution observations carried out with other than seismic apparatus. One of the main conclusions he arrives at is that the distributional velocity of the seismic waves increases rapidly in proximity to the Earth's surface, but slowly towards the centre of the Earth. Another, drawn from the mode of the propagation of the waves, is that the Earth cannot consist of an approximately homogeneous core and a crust likewise in itself almost homogeneous, *i.e.* that the Earth cannot be of bipartite structure. The Earth's interior, on the contrary, is in all probability to be conceived as displaying, in its successive layers, a regular continuity of transition. On the basis of accessory assumptions, he now lays down formulæ respecting the law of such continuity. Once sufficient data in the way of seismic observations have been accumulated, the accuracy of these formulæ will be tested. With the attainment of positive results, it would be demonstrated that for geophysics seismology may have an importance corresponding to that of spectral analysis for astronomy. It might then at last be possible to construct a physical scheme of the Earth's interior.

GENERAL.

The Botany of the British Empire.—Those not behind the scenes hardly, perhaps, recognize the amount of painstaking work which has been devoted in an unostentatious way to improving our knowledge of the botany and vegetable resources of the various colonies and dependencies which form the British Empire. The work, which throughout has received the energetic support of the authorities at Kew, from the time of Sir William Hooker onwards, has been in progress for over half a century, and although made up of separate undertakings not immediately connected with each other, the whole has been carried out so far on a consistent plan that it virtually constitutes a botanical survey of the empire, the gaps in which are relatively few and unimportant. A recent number of the Kew *Bulletin* (No. 2, 1905) puts on record the principal facts connected with the inception and progress of the various parts of the work. While the basis of the whole has been the labours of the staff at Kew in arranging and co-ordinating the vast amount of material there preserved, the actual preparation of successive works for the press has been accomplished largely through the assistance of independent botanists. The first publication which may justly be included in the series was the 'Flora Boreali-Americana,' brought out by Sir William Hooker under the authority of the Secretary of State for Colonial Affairs (1829–1840), and based chiefly on the collections made during the northern land journeys of Franklin and others. Next in order may be placed the botany of the voyage of the *Erebus* and *Terror*, prepared by Sir Joseph Hooker, which included the floras of New Zealand and Tasmania, as well as of other southern lands. These were large and expensive works, and the idea of continuing the series in a cheaper and more practical form originated with Sir William Hooker in 1857, its result being the grant of £300 for a flora of the West Indies by Dr. Griesbach, which was published in 1864. An interesting point connected with this is the warm support given to the scheme by the late Mr. John Ball, who for a short time held the office of Parliamentary Secretary for the Colonies. In 1859 Sir William Denison, Governor-in-Chief of Australia, had suggested to the Colonial Office the publication of a scientific history of the Australian and other colonies, and though the scheme was too vast to be practicable in its entirety, it was taken up as far as botany was concerned by the Duke of Newcastle, and the series of colonial floras (of which that statesman continued a warm supporter) was thus fairly launched. The publication, in 1861, of a flora of Hong

Kong, prepared by Mr. George Bentham, was followed by grants for floras of Australia and New Zealand, while official support was eventually given to those of Ceylon and South Africa, commenced by independent workers. A flora of Mauritius was also prepared by Mr. Baker, of Kew, under the authority of the Colonial Government. A flora of Tropical Africa, originally planned to include the collections of Livingstone's and other expeditions, and placed under the editorship of Prof. Oliver, has, after various vicissitudes, been extended under the charge of Sir W. Thiselton-Dyer so as to form ten volumes, of which the greater part has now been issued. One of the most important of the whole series is the 'Flora of British India,' a monument to the persevering labours of Sir Joseph Hooker, which was completed in 1897; while that of the Malay peninsula has for some time been in active preparation. * A similar undertaking will no doubt be carried out eventually by Canada without outside assistance, while, apart from this, the most important gaps still remaining relate to British Guiana and Honduras.

OBITUARY.

Khan Bahadur Yusuf Sharif.

On June 20 last, at Jabalpur, in India, there passed away one of the best of the native geographers who learned their work in the Indian Survey Department. Khan Bahadur Yusuf Sharif was a Mohammedan gentleman of the best type. Clever and persevering, possessed of considerable mathematical talent, and a genuine thirst for geographical exploration, he was almost typical in these modern days of those splendid Mohammedan geographers who have left us so many valuable records of Asiatic travel in mediæval times. Yusuf Sharif won the good opinion of all officials with whom he had to deal, and would have been a distinguished servant of the Government in any capacity in which he might have been employed. He was one of the small band of native surveyors attached to the Russo-Afghan Boundary Commission of 1884-85, where his skill as a topographer and his power of making friends with all sorts and conditions of men were most useful factors in the acquisition of a large store of geographical knowledge which was new then and has never yet been superseded or revised. Subsequently he was employed in Persia, and was especially successful in dealing with the difficult country of the Bakhtiari tribes. He carried out a rough triangulation from the coast, and gave us our first indications of the nature of the hill districts that intervene between the coasts and Kirman. The great value of his work as a geographer lies in its thoroughness. He was in all respects a most able and trustworthy servant of the Indian Government, who rewarded him with the title of Khan Bahadur. He also received the recognition of the Royal Geographical Society for his excellent work on more than one occasion.

CORRESPONDENCE.

"On the Pretended Phœnician Circumnavigation of Africa."

Many of those who claim a pre-Hellenic antiquity for Zimbabwe and other South African ruins appeal to the Phœnician legend as a confirmation of their views.*

* Dr. A. H. Keane, *Geographical Journal*, vol. 27, p. 338; Dr. Carl Peters, 'The Eldorado of the Ancients,' p. 317; Messrs. Hall and Neal, 'Ancient Ruins of Rhodesia,' p. 29; 'World's History,' vol. 2, p. 590 (English version).

Could they be convinced that this legend tells, not for, but against their theory, they would perhaps be ready to subject it to a somewhat more searching criticism.

It has often been remarked that modern believers accept the story for the very reason which caused Herodotus to hesitate, the mention of a sun on the right hand, which is usually, if somewhat boldly, interpreted to mean a sun seen in the north at noon. It is less generally observed that what made Herodotus himself a believer—namely, the tale that the Phœnicians were able to achieve so enormous an enterprise by raising crops on whatever part of the coast they might have reached when seed-time came round—is so little credible to his followers, that, while professing to accept his story, they generally reject this essential part of it.

Thus Rennell's elaborate argument * is a plea for a story of which Rennell himself, and not Herodotus, is the author. In order to find a really possible method by which his Phœnicians could have renewed their supplies, he was compelled to assume, like modern advocates of a South African Ophir, that a trade with Sofala had already been long in existence. Neither he nor they seem to perceive that, if this theory of a pre-established African trade be true, then the mention of a northerly sun, which was supposed to be of irresistible strength, ceases to have any force whatever. At Sofala, in lat. 20° S., the midday sun is to be seen in the north for much the greater part of the year, and it is ridiculous to suppose that people trading regularly with that port did not know this. If the Phœnicians came back from the far south to startle the world with the tale of a northerly sun, it shows very clearly that they can never have been to the far south before.

Really, however, the modern idea that this tale of a northerly sun must be true because it could not have been invented is largely due to modern ignorance of elementary astronomy. To see the noonday sun *always* in the north one must be south of the southern tropic; to see it there *generally* one must be south of the equator. But merely to have seen it there proves no more than that the observer has been south of the Tropic of Cancer. And so much had been accomplished by civilized man long before Herodotus. That the midsummer sun was vertical at Syene must have been a well-known fact ages before Eratostbenes made use of it to measure the Earth's circumference. And surely the people further south still, as at Meroe, must have known that with them the shadow fell, not to the north, as in Lower Egypt, but to the south. Now, the southern coast of Africa, wherever it was, could not but lie further south still than Meroe.

Why, if Herodotus is to be believed when he speaks of a Phœnician circumnavigation,† does no one believe him when he goes on to speak of a Carthaginian one? How is it that a voyage which should have proved the vast southerly prolongation of Africa came to be cited as a proof that this prolongation was small? How, if even Sofala were known to civilized men, could a theory have long prevailed among geographers that the equatorial region was impassable? Posidonius, who denied this theory,‡ and believed that Africa could be circumnavigated,§ yet rejected the Phœnician legend. Posidonius must have understood the argument from the northerly sun as well as we. Have not we moderns shown ourselves in this matter somewhat less wisely critical than Posidonius?

E. J. Webb.

Burghclere, Newbury.

* 'Geographical System of Herodotus,' pp. 673 *sqq.*

† Herodotus, iv. 42, 43. ‡ Cleomedes, i. 6. § Strabo, ii. p. 98

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Whymper.**

The Valley of Zermatt and the Matterhorn. A Guide. By Edward Whymper. Tenth Edition. Chamonix and the Range of Mount Blanc. By the same. Eleventh Edition. London: John Murray, 1906. Size 7½ × 5. *Maps and Illustrations. Price 3s. each. Presented by the Publisher.*

France. **Demangeon.**

Les sources de la Géographie de la France aux Archives Nationales. Par A. Demangeon. Paris: G. Bellais, 1905. Size 9 × 6, pp. 120. *Price 2s. 3d.*

An interesting study of the way in which historical documents may throw light on the past geography of a country. The author takes stock of the various collections of records in France which are valuable from this point of view, and then gives instances of the light thrown by them on geographical questions.

Norway—Historical. *Norske G.S. Aarbog* **16**, 1904–1905 (1905): 137–155. **Nielsen.**

Middelalderske Samfærselslinier i Norge, langs Kysten og paa Indsøer og Elve. Af Professor Dr. Yngvar Nielsen. *With Maps.*

On mediæval lines of communication.

Norway and Sweden. *Norske G.S. Aarbog* **16**, 1904–1905 (1905): 55–69. **Reusch.**

Norges forhold til Sverige fra et geografisk synspunkt af Dr. Hans Reusch.

Russia. *Scottish G. Mag.* **22** (1906): 194–205. **Sarolea.**

The Geographical Foundations of Russian Politics. By Charles Sarolea.

Sweden. *Arkiv. Botanik K. Svensk. Vet. A. Stockholm* **5** (1) (1905): pp. 152. **Birger.**

De 1882–1886 nybildade Hjälmarö̈arnas vegetation. Af S. Birger. *With Map and Illustrations.*

On the vegetation which sprang up on the ground laid bare by a fall in the level of Lake Hjälmar.

Sweden. *Ymer* (1906): 83–92. **De Geer.**

Dalälfven och dess utskärnigar nedom Alfkarlebyfallen. Af Sten De Geer. *With Plans.*

On the Dalälfven river and the channel excavated below the Alfkarleby falls.

Sweden—Language. **Poestion.**

Lehrbuch der Schwedischen Sprache für den Selbstunterricht. . . . Nach den neuesten und besten Quellen bearbeitet von J. C. Poestion. Dritte Auflage. Wien und Leipzig: A. Hartleben, [not dated]. Size 7 × 4½, pp. viii. and 180. *Price* 2*m*. *Presented by the Publisher.*

Sweden—Phytogeography. **Hesselman.**

Zur Kenntnis des Pflanzenlebens schwedischer Laubwiesen. Eine physiologisch-biologische und pflanzengeographische Studie. Inaugural-Dissertation . . . . von Henrick Hesselman. (Sonderabdruck aus den Beiheften zum botanischen Centralblatt, Jahrgang 1904.) Jena: Gustav Fischer, 1904. Size 9½ × 6, pp. [151]. *Maps, Plates, and Illustrations.*

Switzerland. *Jahresb. G. Ges. Bern* **19**, 1903–4 (1905): 1–78. **Groll.**

Der Oeschinensee. Von Dr. Max Groll. *With Illustration and Diagrams.*

Switzerland—Census. ———

Résultats provisoires du recensement fédéral des entreprises agricoles, industrielles et commerciales. 9 août 1905. (Statistique de la Suisse, 147e liv.) Bern: Neukomm & Zimmermann. Size 11 × 9, pp. viii. and 184.

Switzerland—Relief. *B.S. Neuchatel. G.* **16** (1905): 5–16. **Gobet.**

Quelques réflexions sur la répartition de la hauteur moyenne en Suisse d'après le travail du Dr. Lieb. Par L. Gobet. *With Maps.*

This has been noticed in the Monthly Record.

United Kingdom—Dorset. **Strahan.**

Memoirs of the Geological Survey: England and Wales. Guide to the Geological Model of the Isle of Purbeck. By Aubrey Strahan. London, 1906. Size 9½ × 6½, pp. 26. *Maps and Sections.*

United Kingdom—Dorset. **Treves.**

Highways and Byways in Dorset. By Sir Frederick Treves, Bart. With Illustrations by Joseph Pennell. London: Macmillan & Co., 1906. Size 8 × 5½, pp. xviii. and 376. *Map and Illustrations. Price* 6*s*. *Presented by the Publishers.*

United Kingdom—Earthquakes. *Nineteenth Century* **59** (1906): 458–470. **Davison.**

Earthquakes in Great Britain. By Dr. Charles Davison.

United Kingdom—Meteorology. ———

The Weather of 1905 at Hodsock Priory, Worksop. With Summaries for the 30 years 1876 to 1905. Size 8½ × 5½, pp. 30. *Diagrams.*

United Kingdom—Thames. *P.R.S.*, Ser. A., **76** (1905): 494–506. **Lockyer.**

The Flow of the River Thames in Relation to British Pressure and Rainfall Changes. By Sir Norman Lockyer, K.C.B., etc., and William J. S. Lockyer, PH.D. *With Diagrams.*

ASIA.

Mongolia and Tibet. **Kozloff.**

Mongolia and Kham. Works of the Expedition of the Imperial Russian Geographical Society during 1899–1901, under the direction of P. K. Kozloff. Vol. 1. [In Russian.] St. Petersburg, 1905–6. Size 12 × 9, pp. x. and 734. *Maps and Plates. Presented by the Imperial Russian Geographical Society.* [To be reviewed.]

Russia—Caucasus. *Deutsch. Rundschau G.* **28** (1906): 244–259. **Weinberg.**

Die Bevölkerung des Kaukasus in statistischer und ethnischer Beziehung. Von Dr. R. Weinberg.

Russian Central Asia. *Norske G.S. Aarbog.* **16**, 1904–1905 (1905): 77–127. **Bjerkan.**

Fra en reise i Vest-Turkestan. Af Paul Bjerkan. *With Illustrations.*

Turkey—Palestine. **Macalister.**

Palestine Exploration Fund, Quarterly Statement (1906): 133–142.

Browne's Travels in Palestine, 1797. By R. A. Stewart Macalister.

Turkey—Palestine and Syria. **Baedeker.**

Palestine and Syria, with the chief routes through Mesopotamia and Babylonia. Handbook for Travellers. By Karl Baedeker. Fourth edition. Leipzig: K. Baedeker; London: Dulau & Co., 1906. Size 6½ × 4½, pp. c. and 436. *Maps, Plans, and Panorama. Price* 12*m*. *Presented by Messrs. Dulau & Co.*

AFRICA.

Abyssinia—Historical. **Beccari.**

Rerum Æthiopicarum Scriptores occidentales inediti a sæculo xvi. ad xix. curante C. Beccari S.I. Vols. **2** and **3**. P. Petri Paez S.I. Historia Æthiopiæ. Liber i. et ii., and iii. et iv. Romæ: C. de Luigi, 1905, 1906. Size 11 × 8, pp. (vol. 2) xlii. and 644; (vol. 3) xiv. and 586. *Plates.*

Paez's famous work is here printed for the first time (cf. review of the introductory volume in *Journal*, vol. **24**, p. 213).

French Congo. **Rouget.**

L'expansion Coloniale au Congo français. Par F. Rouget. Avec une Introduction par E. Gentil, et une Lettre-Preface de A. Duchêne. 2ème édn. Paris: E. Larose, 1906. Size 10 × 6½, pp. viii. and 942. *Maps and Illustrations. Price* 8*s.* 6*d.*

A systematic account of French Congo and its people, and of the administrative developments under French rule.

North-West Africa. *La G., B.S.G. Paris* **13** (1906): 148–149. **Arnaud.**

Chasseurs et pêcheurs du Tagant et du Hodh. Par Robert Arnaud.

Sahara. *C.R.* **142** (1906): 241–243, 530–531. **Chudeau.**

Nouvelles observations sur la géologie du Sahara. D'Iférouane à Zinder. Notes de René Chudeau.

Noticed in the May number (p. 505).

South Africa. *T. Geol. S. South Africa* **8** (1905): 110–134. **Harger.**

The Diamond Pipes and Fissures of South Africa. By H. S. Harger.

South Africa—Boers. *Rev. Française* **31** (1906): 149–161. **Demanche.**

La formation de la nation Boer. Par G. Demanche. *With Maps.*

South and East Africa.

The Africa Pilot. Part III. South and East Coasts of Africa from the Cape of Good Hope to Ras Asir (Cape Guardafui), including the Comoro Islands. Originally compiled by Captain Algernon F. R. De Horsey. Seventh edition. London: J. D. Potter, 1905. Size 9½ × 6, pp. xxvi. and 622. *Index-charts. Price* 3*s.*

Spanish Colonies. *Questions Dipl.* **21** (1906): 193–205. **Lorin.**

Les colonies espagnoles du golfe de Guinée. Par H. Lorin. *With Map.*

West Africa. **Delevoye.**

Enseigne de Vaisseau Delevoye, Second de la Mission Lenfant (1903–1904). En Afrique Centrale (Niger—Bénoué—Tchad). Lettre-Préface de M. Lucien Hubert. Paris: H. Le Soudier, 1906. Size 7½ × 5, pp. viii. and 276. *Map and Illustrations. Price* 3.50 *fr.*

West Africa. **Gruvel and Bouyat.**

Les Pêcheries de la Côte occidentale d'Afrique. Par A. Gruvel et A. Bouyat. Paris: A. Challamel, 1906. Size 10 × 6½, pp. 280. *Maps and Illustrations. Price* 8*s.*

West Africa—Historical. **Machat.**

Documents sur les établissements Français de l'Afrique occidentale au XVIII^e^ siècle. Par J. Machat. Paris: A. Challamel, 1906. Size 10 × 6½, pp. 140. *Map. Price* 2*s.* 6*d.*

NORTH AMERICA.

America. **Muller.**

Door het Land van Columbus. Een Reisverhaal door Dr. H. P. N. Muller. Haarlem: De Erven F. Bohn, 1905. Size 10 × 6½, pp. x. and 504. *Illustrations. Presented by the Author.*

Narrative of an extensive journey through North and Central America, including the Dutch West Indies.

Canada—Anticosti. **Schmitt.**

Monographie de l'Ile d'Anticosti (Golfe Saint-Laurent). Par Joseph Schmitt. Paris: A. Hermann, 1904. Size 10 × 6½, pp. vi. and 370. *Maps and Illustrations. Price* 12*s.*

A systematic account of the island, its climate and natural history.

Canada—Historical. **Baxter.**

A Memoir of Jacques Cartier, Sieur de Limoilou. His Voyages to the St. Lawrence, a Bibliography and a Facsimile of the Manuscript of 1534, with Annotations, etc. By Dr. J. P. Baxter. New York: Dodd, Mead & Co.; London: H. Stevens, 1906. Size 10 × 6½, pp. 464. *Facsimile Maps and Illustrations. Price* 42*s.*

The first adequate edition of Cartier's voyages that has appeared.

United States—Massachusetts. **Sears.**

The Physical Geography, Geology, Mineralogy, and Paleontology of Essex County, Massachusetts. By John Henry Sears. Salem, Mass.: Published by the Essex Institute, 1905. Size 11½ × 8½, pp. 418. *Map and Illustrations.*

United States—Surveys. **Waterhouse.**

Report on the United States Government Surveys. By Major-General J. Waterhouse (late Survey of India). Published by Colonel F. B. Longe, Surveyor-General of India. Calcutta, 1906. Size 13½ × 8½, pp. 48. *Illustrations. Presented by the Author.*

United States—Utah. **Davis.**

B. Museum Comp. Zoology, Harvard Coll., Geol. Ser. **8** (1905): 13–58.

The Wasatch, Canyon, and House Ranges, Utah. By W. M. Davis. *With Illustrations.*

CENTRAL AND SOUTH AMERICA.

Dutch Guiana. **Cappelle.**

Au travers des Forêts vierges de la Guyane Hollandaise. Par H. van Cappelle. Baarn; Paris: C. Béranger, 1905. Size 11 × 8, pp. 198. *Map and Illustrations. Price* 16*s.*

Account of an exploration of the Nikeri river, apparently in 1900, though the year seems nowhere to be definitely stated.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Lee.**

The Coming of the British to Australia, 1788 to 1829. By Ida Lee (Mrs. Charles Bruce Marriott). Preface by the Right Hon. the Marquis of Linlithgow. London: Longmans & Co., 1906. Size 9 × 6, pp. xviii. and 350. *Illustrations. Price* 7*s.* 6*d. net. Presented by the Publishers.*

[To be reviewed.]

New Zealand. **MacDonald.**

Geography of New Zealand for Senior Pupils in the Public Schools, Scholarship Candidates, and Pupil Teachers. By J. R. MacDonald. Wellington and Christchurch, N.Z.: Gordon & Gotch Proprietary, 1903. Size 7½ × 5, pp. 118. *Maps and Illustrations. Price* 1*s.* 6*d. Presented by the New Zealand Government.*

The treatment appears, on the whole, satisfactory, the main surface features of the islands being clearly and adequately described.

POLAR REGIONS.

Arctic—Norwegian Expedition. **Nansen.**

The Norwegian North Polar Expedition, 1893–1896. Scientific Results. Edited by Fridtjof Nansen. Vol. 5. London: Longmans & Co., 1906. Size 12 × 9½, pp. 62, x. and 152, and 22. *Maps and Plates. Presented by the Fridtjof Nansen Fund.*

Includes Memoirs on the Bottom Deposits of the North Polar Sea; on "Dead Water"; and on Protozoa of the northern ice-floes.

MATHEMATICAL GEOGRAPHY.

Refraction. **Ball.**

Refraktionstafeln. Von Dr. L. de Ball. Leipzig: W. Engelmann, 1906. Size 12½ × 8, pp. xiv. and 18. *Price* 2*s.* 6*d.*

Give the results of recalculations on the basis of Radau's theory.

Surveying. **Flemer.**

An Elementary Treatise on Photographic Methods and Instruments, including a Concise Review of executed Photographic Surveys and of Publications of this

Subject. By J. A. Flemer. New York: J. Wiley & Sons; London: Chapman & Hall, 1906. Size 9½ × 6, pp. xx. and 438. *Plates.* 21*s. net. Presented by Messrs. Chapman & Hall.* [To be reviewed.]

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Oceanography. **Herwig.**

Die Beteiligung Deutschlands an der Internationalen Meeresforschung. III. Jahresbericht, erstattet von dem Vorsitzenden der Wissenschaftlichen Kommission Dr. W. Herwig. Berlin: Otto Salle, 1906. Size 11½ × 8, pp. vi. and 192. *Charts and Diagrams. Presented by the Deutschen Wissenschaftlichen Kommission für die Internationale Meeresforschung.*

Oceanography—Current-meter. **Witting.**

Conseil Perm. Int. Explor. Mer, Publ. Circonstance, No. 30 (1905): pp. 8.

Kurze Beschreibung eines elektrisch registrierenden Strommessers. Von Rolf J. Witting. *With Illustrations.*

Oceanography—Currents. **Nansen and Ekman.**

Conseil Perm. Int. Explor. Mer, Publ. Circonstance, No. 34 (1906): pp. 42.

Fridtjof Nansen. Methods for measuring direction and velocity of Currents in the Sea. With an Appendix by Dr. V. Walfrid Ekman. *With Illustrations.*

Oceanography—Currents. *C.R.* **142** (1906): 245–246. **Thoulet and Chevallier.**

Sur la circulation océanique. Note de MM. Thoulet et Chevallier.

Oceanography—Methods. **Kofoid.**

Conseil Perm. Int. Explor. Mer, Publ. Circonstance, No. 32 (1905): pp. 10.

Charles Atwood Kofoid. A self-closing Water Bucket for Plankton Investigations. *With Illustrations.*

Oceanography—Tides. *B. Musée Océanog. de Monaco*, No. 68 (1906): pp. 20. **Berget.**

Cours d'Océanographie fondé à Paris par S. & S. le Prince de Monaco; 2e Année. Les Marées. Par A. Berget. *With Diagrams.*

Soils. **Ramann.**

Bodenkunde. Von Dr. E. Ramann. Zweite Aufl. Berlin: J. Springer, 1905. Size 9½ × 6½, pp. xii. and 432. *Price* 9*s.*

Speleology. **Knebel.**

Höhlenkunde mit Berücksichtigung der Karstphänomene. Von Dr. Walther von Knebel. (Der Wissenschaft, Heft 15.) Braunschweig: F. Vieweg u. Sohn, 1906. Size 9 × 6, pp. xvi. and 222. *Illustrations. Price* 5*s.* 6*d.*

A systematic text-book of speleology.

Volcanoes. *Verh. 15 Deutsch. Geographentages Danzig* (1905): 135–150. **Friederichsen.**

Dr. Moritz Alphons Stübels Verdienste um die moderne Vulkanologie. Von Dr. Max Friederichsen.

Zoogeography—Fishes. **Trybom.**

Conseil Perm. Int. Explor. Mer, Publ. Circonstance, No. 28 (1905): pp. 34.

Bericht über die Anstalten zur Vermehrung des Lachses und der Meerforellen in den Flüssen der Ostsee . . . bearbeitet von Dr. Fil. Trybom.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Reclus.**

Élisée Reclus. L'Homme et la Terre, Tome 1er, Les Primitifs, Histoire Ancienne. Origines, Milieux telluriques, Travail, Peuples attardés, Familles, Classes, Peuplades, Rythme de l'Histoire, Iranie, Caucasie, Potamie. Paris: Librairie Universelle, [*not dated*]. Size 11½ × 8½, pp. iv. and 580. *Maps and Illustrations. Price* 15 *fr. Presented by M. Paul Reclus.* [To be reviewed.]

Commercial—Cocoa-nut. **Prudhomme.**

Le Cocotier, Culture, Industrie et Commerce dans les principaux pays de production. Coprah, Huile, Fibre de Coco et dérivés divers. Par E. Prudhomme. Paris: A. Challamel, 1906. Size 10 × 6½, pp. 492. *Illustrations. Price* 11*s.* 6*d.*

Historical—Early Travels. **Purchas.**

Hakluytus Posthumus, or Purchas His Pilgrimes. By Samuel Purchas, B.D. Vols.

13 and **14**. Glasgow: J. MacLehose & Sons, 1906. Size 9 × 6, pp. (vol. **13**) xx. and 560; (vol. **14**) xx. and 592. *Facsimile Maps.*

These volumes embrace the conclusion of the early English and Dutch voyages to the north, and the beginning of the American section.

Historical—Maps. *Riv. G. Italiana* **12** (1905): 585–601. **Marinelli.**

Esame di sei carte nautiche dei secoli XVI. e XVII. Appunti di Olinto Marinelli.

Discusses the sources and relationships of six Italian maps of the Mediterranean, or parts of it, with dates between 1556 and 1615.

Historical—Sakas. *J.R. Asiatic S.* (1906): 460–464. **Thomas.**

Sakastana. By F. W. Thomas.

Supplementary notes (cf. May number, p. 522).

Historical—Vinland Voyages. **Nielsen.**

Norske G.S. Aarboy **16**, 1904–1905 (1905): 1–41.

Nordmænd og Skrælinger in Vinland. Af Professor Dr. Yngvar Nielsen.

History of Geography. **Lefranc.**

Les Navigations de Pantagruel. Étude sur le Géographie Rabelaisienne. Par Abel Lefranc. Paris: H. Leclerc, 1905. Size 10 × 6½, pp. 334. *Facsimile Maps and Illustrations. Price* 9*s.*

Interesting as throwing light on the geographical knowledge of the time of Rabelais and the actual sources from which he drew his descriptions.

History of Geography. *G.Z.* **12** (1906): 20–37. **Berger.**

Die Lehre von der Kugelgestalt der Erde im Altertum. Vortrag, gehalten im Verein für Erdkunde in Halle, von Hugo Berger.

History of Geography. **d'Eça.**

Sociedade de Geographia de Lisboa. Algumas Cartas ineditas do Visconde de Santarem, com uma introducção e notas por Vicente Almeida d'Eça. Lisboa, 1906. Size 10 × 6¼.

Religions—Historical. **Magnaghi.**

Riv. G. Italiana **12** (1905): 257–266, 369–375, 464–475, 523–530.

La Statistica delle Religioni ai primi del Secolo XVII. secondo Giovanni Botero, di Alberto Magnaghi.

BIOGRAPHY.

Ferrari. *Riv. G. Italiana* **12** (1905): 329–339, 459–463. **Almagià.**

Le opinioni e le conoscenze geografiche di Antonio de Ferrariis. Memoria di Roberto Almagià.

Antonio Ferrari, surnamed Galateo, lived in the latter half of the fifteenth and early part of the sixteenth century, and among his various writings paid some attention to geography and map-making.

Gordon. **Gordon.**

A Varied Life. A Record of Military and Civil Service, of Sport and of Travel in India, Central Asia, and Persia, 1849–1902. By General Sir Thomas Edward Gordon, K.C.B., etc. London: John Murray, 1906. Size 9 × 6, pp. xvi. and 358. *Illustrations. Price* 15*s. net. Presented by the Publisher.* [To be reviewed.]

Reclus. *G.Z.* **12** (1906): 65–79. **Girardin and Brunhes.**

Elisée Reclus' Leben und Wirken (1830–1905). Von Paul Girardin und Jean Brunhes.

Richthofen. *G.Z.* **12** (1906): 1–11. **Hettner.**

Ferdinand von Richthofens Bedeutung für die Geographie. Von Alfred Hettner.

Richthofen. *Riv. G. Italiana* **12** (1905): 577–584. **Porena.**

Ferdinando von Richthofen e la sua opera scientifica. Nota del Prof. Filippo Porena.

Wissmann. *G.Z.* **12** (1906): 12–20. **Kirchhoff.**

Hermann v. Wissmann zum Gedächtnis. Von Alfred Kirchhoff.

GENERAL.

Bibliography.

International Catalogue of Scientific Literature. Fourth Annual Issue. H. Geology. London: Harrison & Sons, 1906. Size 8½ × 5½, pp. viii. and 250. *Price* 16*s.* 6*d.*

British Empire. *R. Engineers J.* 3 (1906): 319-338. **Maguire.**

The Frontiers of the British Empire. By Dr. T. Miller Maguire. *With Maps.*

British Empire. *Kew B.* (1905): 9-43.

Botanical Survey of the Empire.

Sketches the work done during the last half-century (cf. *ante*, p. 296).

Catalogue of Maps. **[Soulsby.]**

British Museum. Catalogue of Maps. Accessions. Part xxxix. March, 1906. London: Printed by William Clowes & Sons, 1906. Size 11½ × 9, pp. 274. *Presented by the Superintendent of the Map Room, British Museum.*

A most useful catalogue, including maps in printed books as well as those published separately. It is not only a guide to recent maps, but gives the titles of all older maps lately added to the national collection.

Educational.

Report of the Felsted School Scientific Society (founded 1877) for the year 1905. Earls Colne, 1906. Size 8½ × 5½, pp. 16.

The society includes a geographical section.

Educational—Cartography. *J.G.* 5 (1906): 161-175. **Jefferson.**

About Nets for Map Drawing. By M. S. W. Jefferson. *With Illustrations.*

Exhibition. **Spielmann.**

Royal Commission St. Louis International Exhibition, 1904. The British Section. Compiled by Sir Isidore Spielmann. Issued by the Royal Commission, 1906. Size 14 × 11, pp. 392. *Illustrations. Presented by the Commission.*

Geographical Memoirs. **Ratzel and Helmolt.**

Kleine Schriften von Friedrich Ratzel. Ausgewählt und herausgegeben durch Hans Helmolt. Mit einer Bibliographie von Viktor Hantzsch. 2 vols. München und Berlin: R. Oldenbourg, 1906. Size 10 × 7, pp. (vol. 1) xxxvi. and 530; (vol. 2) x., 542, and lxii. *Portraits. Price* 22*s.* 6*d.*

A collection of articles and memoirs from a variety of scattered sources, some of them not generally accessible.

Geographical Society. *B.S. Khédiviale de G.*, 6 Ser. (1906): 435-459. **Abbate and Zéki.**

Centenaire de Mohamed Ali et trentième anniversaire de la fondation de la Société de Géographie. Par Dr. Abbate Pacha et Zéki Bey. *With Portrait.*

Geography.

The "Round the World" Series. Our Planet. London: T. C. & E. C. Jack, [*not dated*]. Size 7½ × 5, pp. 256. *Maps and Illustrations. Price* 1*s.* 6*d. Presented by the Publishers.*

This volume treats of the Earth in relation to other heavenly bodies, and of the broader distributions on its surface.

NEW MAPS.

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England and Wales. **Ordnance Survey.**

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France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale: 1:100,000 or 1 inch to 1·6 stat. mile. Sheets (new editions): XVIII.-12, Crépy-en-Valois; XVIII.-26, Isoire; XXIII.-33, Apt; XXXI.-38, Bastia. Paris: Ministère de l'Intérieur, Service Vicinal, 1906. *Price* 0.80 *fr. each sheet.*

Glasgow. **Johnston.**

Plan of Glasgow. Scale: 1:10,560 or 6 inches to one stat. mile. Edinburgh: W. & A. K. Johnston, [1906]. *Price* 2*s., mounted on cloth. Presented by the Publisher.*

A good useful plan of Glasgow, clearly drawn and printed in colours. For the purpose of general reference, an index might have been added with advantage.

Scandinavia. **Roth.**

Norden af Dr. Magnus Roth. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. 8 sheets. Stockholm: P. A. Norstedt & Sons, 1906.

A new edition of an orographically coloured wall-map of Norway, Sweden and Denmark which first appeared in 1883. It is boldly executed, the names of all important places being printed in large type so as to be seen at a distance, while the smaller names can be read upon close inspection.

ASIA.

China. **Topographical Section, General Staff.**

Province of Ché-Chiang (provisional issue). Scale 1:1,000,000 or 1 inch to 15·8

stat. miles. London: Topographical Section, General Staff, War Office, 1906. *Price 2s. Presented by the Director of Military Operations.*

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 1 inch to 4 miles. Sheets: 2 N.E., parts of districts Larkhana, Karachi, and Hyderabad (Sind, Bombay Presidency), additions and corrections to 1903. 16 N.W., parts of districts Dera Ismail Khan (N.W. Frontier Province), Mianwali, and Shahpur (Punjab), corrections to 1905. 24 N.E., parts of districts Surat, Thana, and Nasik, and of Dharampor, Bansda, Jawhar, and Surgana States (Bombay Presidency), and Daman (Portuguese Territory), additions to 1902. 36 S.E., parts of States Ali Rajpur, Jobat, Jhabua, Gwalior, Indore, and Dhar (C.I. Agency), additions to 1903. 41 N.W., parts of districts Belgaum and Ratnagiri, of Kolhapur, Kurundvad, Sangli, Inchalkaranji, Bavda, Kagal, and Savantvadi States (Bombay Presidency), and of Goa (Portuguese Territory), 1905. 43, parts of South Kanara, Malabar, and Coorg (Madras Presidency), and Mysore State, additions to 1905. 59 N.E., parts of districts Chitaldroog (Mysore) and Anantapur, Bellary, Cuddapah, and Kurnool (Madras Presidency), additions to 1898. 60 S.E., parts of districts Mysore, Bangalore, Tumkur, and Kolar (Mysore), and of Salem and Coimbatore (Madras Presidency), additions to 1904. 73, parts of districts Indur, Tandur (Nizam's Dominions), Amraoti, Wun, Wardha, Chanda, Nagpur, and Bhandara, and of State Bastar (Central Provinces), additions to 1903. 90 S.W., parts of districts Mandla, Bilaspur, and Balaghat (Central Provinces), and Rewah State (C.I. Agency), addition to 1904. 105 S.W., parts of districts Ranchi (Bengal) and Bilaspur (Central Provinces), and of States Gangpur (Bengal), Sargija, Jashpur, Udaipur, and Raigarh (Central Provinces), additions to 1905. 118, parts of districts Dinajpur, Goalpara, Garo Hills, and Rangpur (East Bengal and Assam), Darjeeling, Purnea, and Bhutan, Cooch Behar and Sikkim States (Bengal), additions to 1903.—Index to Indian Atlas, showing sheets that have been published up to October 1, 1905.—Province of Eastern Bengal and Assam, 1 inch to 32 miles, 1906.—Madras Presidency, 1 inch to 32 miles, additions to July, 1905.—Assam, 1 inch to 4 miles. District Sibsagar, 1905.—Bengal, 1 inch to 4 miles. District Cuttack, 1905.—Lower Provinces, Bengal, 1 inch to 4 miles. District Patna, additions to 1905.—Part of Eastern Bengal and Assam, 1 inch to 4 miles. District Tippera (Second Edition), 1906. —Bombay, 1 inch to 4 miles. District Kolaba, 1906.—N.W. Frontier Province, 1 inch to 4 miles. District Kohat, 1906.—United Provinces of Agra and Oudh, 1 inch to 4 miles. Districts: Hardoi, additions to 1905; Meerut, 1906; Partabgarh, additions to 1905.—Central Provinces, 1 inch to 12 miles. District Balaghat, 1905.—United Provinces of Agra and Oudh, 1 inch to 8 miles. District Partabgarh, 1905.—Levels in the Punjab, 1 inch to 2 miles, 1905.—North-Western Trans-Frontier Survey, 1 inch to 4 miles. Sheet 7 N.W. (Preliminary Edition), part of Persia (Bandar Abbas, 1905.—South-Western Asia Survey, 1 inch to 4 miles. Sheet 89 S.W., part of Persia (Laristan), 1905.—Bengal Survey, 1 inch to a mile. Sheets: 99 (Second Edition), parts of States Bamra, Gangpur, and Bonai, Seasons 1861-63, 1905; 100 and 101 (Second Edition), parts of States Bamra and Bonai (Bengal), Season 1861-62, 1905; 128 (Second Edition), parts of district Singhbhum and States of Gangpur, Bonai, and Keonjhar, Seasons 1860-62, 1906; 309, parts of districts Nadia, Jessore, Khulna, and 24 Parganas, Seasons 1848-53, 1906.—Eastern Bengal and Assam Survey, 1 inch to a mile. Sheet 426 (Second Edition), parts of districts Chittagong (East Bengal and Assam), and Akyab (Burma). Seasons 1883-87, 1888-93, 1905.—Bombay Survey, 1 inch to a mile. Sheets: 59 (Second Edition), parts of States Navanagar, Dhrol, Khirasra, Morvi, Vankaner, and Kotra Nayani (Kathiawar Agency), Season 1873-74, additions to 1905; 106, parts of districts Ahmedabad, Baroda State, and Mahi Kantha, and Kathiawar Agencies, Season 1875-76, additions to 1903; 120, parts of district Ahmedabad, Mahi Kantha Agency and Baroda Agency, Seasons 1878-80, additions to 1902; 130 (Second Edition), parts of district Surat and of States Baroda and Sachin, Seasons 1876-77, 1880-81, additions to 1902; 282 parts of districts Kanara (Bombay) and Shimoga (Mysore) (Madras), Seasons 1881-83, 1898-1901, 1905; 336, parts of districts Chitaldroog (Mysore), Madras, and Dharwar (Bombay), Season 1882-83, 1893-94, additions to 1905.—Burma Survey, 1 inch to a mile. Sheets: 2, parts of district Chittagong (East Bengal and Assam) and Akyab (Burma), Seasons 1883-87, 1888-93, 1905; 75 (N.S., Preliminary Edition), parts of districts Minbu, Thayetmyo, and Kyankpyu, Season 1903-04, 1905; 114 (N.S.), part of district Thayetmyo, Season 1900-01, 1905; 127 (N.S., Second Edition), parts of districts Bassein and Myaungmya, Seasons 1886-87, 1889-92, 1905; 211 (Second Edition), parts of districts Tharra-

waddy and Henzada, Seasons 1880–85, 1902–03, 1905; 214 (Third Edition), parts of districts Henzada, Ma-ubin, Hanthawaddy, and Tharrawaddy, Seasons 1882–84, 1888–89, 1902–03, 1905; 295 (Second Edition), parts of district Yamethin and Southern Shan States, Seasons 1894–95, 1899–1900, 1905; 568, 609 (N.S.), parts of Southern Shan States, Season 1903–04, 1905.—Central India and Rajputana Survey, 1 inch to a mile. Sheet 413, parts of district Jalaun (United Provinces), Datia, and Gwalior (C.I. Agency), Seasons 1852–56, 1906.—Central Provinces Survey, 1 inch to mile. Sheet 19 (Second Edition), parts of district Mirzapur (United Provinces) and Sarguja State (Central Provinces), Season 1867–68, 1883–84, 1905.—Madras Survey, 1 inch to a mile. Sheets: 2 (Second Edition), parts of districts Kanara (Bombay) and Shimoga (Mysore) (Madras), Seasons 1881–83, 1898–1901, 1905; 23 (Second Edition), parts of districts Chitaldroog (Mysore), Madras, and Dharwar (Bombay), Seasons 1882–83, 1893–94, additions to 1905; 24, parts of districts Dharwar (Bombay), Shimoga, and Chitaldroog (Mysore), Seasons 1882–83, 1893–94, corrected to 1903.—Punjab Survey, 1 inch to a mile. Sheets: 198 (Preliminary Edition), parts of districts Montgomery and Ferozepore, Seasons 1901–02–03, 1905; 279, parts of districts Rohtak and Gurgaon and States Nabha, Patiala, Jind, Dujana (Punjab), and Jaipur (Rajputana), Seasons 1861–63, 1867–68, 1874–75, 1905.—Sind Survey, 1 inch to 2 miles. Sheets: 41, 42, 61, 62, parts of districts Larkhana, Hyderabad, Sukkur, and Khairpur State, Seasons 1893–94, 1901–03, 1905.—Sind Survey, 1 inch to a mile. Sheets: 8, district Larkhana, Season 1900–01, 1905; 25, district Larkhana and Hyderabad, Seasons 1893–94, 1901–03, 1905; 44, district Hyderabad and Kairpur State, Season 1901–04, 1905; 59, district Sukkur, Seasons 1892–93, 1899–1901, 1905.—United Provinces Survey, 1 inch to a mile. Sheets: 84 (Third Edition), parts of districts Bareilly, Dudaun, Shajahanpur and Pilibhit, Seasons 1895–1900, 1905; 115 (Second Edition), part of district Kheri, Seasons 1892–93, 1895–99, 1905; 116 (Second Edition), parts of districts Kheri and Sitapur, Seasons 1864–65, 1895–97, 1904–05; 132, districts Kheri, Sitapur, and Bahraich, Seasons 1863–67, additions to 1904, 1905; 136, parts of districts Lucknow, Unao, Rai Bareli, and Bara Banki, Season 1860–64, additions to 1903; 138, part of district Rae Bareli, Season 1861–63, additions to 1904; 202 (Second Edition), parts of district Mirzapur (United Provinces) and Sarguja State (Central Provinces), Seasons 1867–68, 1883–84, 1905.—*Presented by the Secretary of State for India through the India Office.*

Korea. **Zveginzof and Korf.**

Map of Northern Korea, constructed by A. I. Zveginzof and Baron N. A. Korf. Scale 1 : 840,154 or 1 inch to 13·3 stat. miles. 1904. [In Russian.] *Presented by Colonel J. de Shokalsky.*

A short time before the outbreak of the Russo-Japanese war, M. A. Zveginzof and Baron N. A. Korf made an extensive journey through Northern Korea, during which surveying was carried on as well as circumstances would admit, the result of which work, combined with that of earlier travellers, is shown on this map. The positions of thirteen points were determined astronomically by M. Zveginzof, and these, together with other determinations by Colonel Strelbitzki, enabled the authors to adjust their route-traverses. The relief is shown by approximate contours or form-lines, resulting from many barometric observations taken during the journeys. Although necessarily incomplete in many parts, this map is, in some respects, an advance on others of the same region which have appeared.

Siberia. **Tillo.**

Carte des bassins des océans, mers, fleuves et lacs de la Russie d'Asie et des pays limitrophes, dressée par le Sénateur, général-lieutenant d'Etat-Major A. de Tillo. Scale 1 : 4,200,000 or 1 inch to 66·3 stat. miles to an inch. 4 sheets. St. Petersburg: Ministère des Voies et Communications, 1905. *Presented by Colonel J. de Shokalsky.*

This large map of Asiatic Russia and surrounding regions has been published as a supplement to the memoir, in Russian, 'Superficie de la Russie d'Asie.' The various river-basins are clearly marked out by coloured lines, the larger drainage areas being shown by broad lines of colour, and the basins of the tributaries by narrower lines. It is far more than a rough diagram, as the special colouring is superimposed on what is really a most useful general map of Asiatic Russia, giving many place-names and much general information, although without hills, which would only have tended to confuse.

AFRICA.

Egypt. **Survey Department, Cairo.**

Map of Egypt. Scale 1 : 50,000 or 1 inch to 1·3 stat. miles. Sheets: S.E. I–1, III.–1. Cairo: Public Works Ministry, Survey Department, 1906. *Presented by the Director-General, Survey Department, Cairo.*

Egypt. **Survey Department, Cairo.**

Topographical map of Giza Province. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: N.E. I–2; S.E. I–5, I–6. Cairo: Public Works Ministry, Survey Department, 1904–05. *Presented by the Director-General, Survey Department, Cairo.*

French Congo. **Barralier.**

Carte du Congo Français dressée par Emmanuel Barralier. Scale 1 : 5,000,000 or 1 inch to 78·9 stat. miles. Paris: Service Géographique des Colonies, 1906.

Kamerun. **Moisel.**

Das Zwischenstromland des Logone und Schari von Lai-Nielim bis Kusseri-Ft. Lamy bearbeitet und gezeichnet von M. Moisel. Scale 1 : 750,000 or 1 inch to 11·8 stat. miles. *Mitteilungen aus den deutschen Schutzgebieten*, Band XIX., Karte 2. Berlin: E. S. Mittler & Son, 1906.

Kamerun. **Moisel.**

Provisorische Karte der Gebirgslandschaften des Militärbezirkes Fontem bearbeitet von M. Moisel. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. *Mitteilungen aus den deutschen Schutzgebieten*, Band XIX., Karte 1. Berlin: E. S. Mittler & Son, 1906.

AMERICA.

Canada. **Department of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 21, Turtle mountain, revised to April 17, 1906; 22, Dufferin, revised to April 26, 1906; 73, Winnipeg, revised to May 26, 1906; 316, Vermilion, revised to May 18, 1906. Ottawa: Department of the Interior, Topographical Surveys Branch, 1906. *Presented by the Canadian Department of the Interior.*

United States. **U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1 : 125,000 or 1 inch to 1·9 stat. mile. Folios: 128, Aladdin, Wyoming—South Dakota—Montana, 1905; 129, Clifton, Arizona, 1905; 130, Rico, Colorado, 1905; 131, Needle mountains, Colorado, 1905; 132, Muscogee, Indian Territory, 1906; 133, Ebensburg, Pennsylvania, 1905; 134, Beaver, Pennsylvania, 1905; 135, Nepesta, Colorado, 1906. Washington: Department of the Interior, U.S. Geological Survey. *Price 25 cents each folio. Presented by the U.S. Geological Survey.*

AUSTRALIA.

New South Wales. **Department of Lands, Sydney.**

New South Wales, including Lord Howe Island. Scale 1 : 1,013,760 or 1 inch to 16 stat. miles. 4 sheets. Sydney: Department of Lands, 1905. *Presented by the Under-Secretary for Lands, New South Wales.*

New South Wales. **Department of Lands, Sydney.**

Wheat map of New South Wales, showing boundaries of wheat districts, with actual acreage for grain and average yield per acre in such districts for the ten years ending March 31, 1904. Scale 1 : 1,013,760 or 1 inch to 16 stat. miles. 4 sheets. Sydney: Department of Lands, 1905. *Price 10s. Presented by the Under-Secretary for Lands, New South Wales.*

New South Wales. **Department of Lands, Sydney.**

Tourist map of the south coast, New South Wales. Scale 1 : 633,600 or 1 inch to 10 stat. miles. Sydney: Department of Lands, 1906. *Presented by the Under-Secretary for Lands, New South Wales.*

New South Wales. **Department of Lands, Sydney.**

Map of New South Wales, indicating Eastern, Central, and Western Divisions. Scale 1 : 3,168,000 or 1 inch to 50 stat. miles. Sydney: Department of Lands, 1906. *Presented by the Under-Secretary for Lands, New South Wales.*

New South Wales. **Dept. of Lands, Sydney.**

Map of New South Wales Railways, showing coach and other routes from the various stations, together with mileage from Sydney. Scale 1 : 1,837,440 or 1 inch to 29 stat. miles. Sydney : Department of Lands, 1906. *Presented by the Under-Secretary for Lands, New South Wales.*

South Australia. **Surveyor-General, South Australia.**

Plan showing pastoral leases in the Northern Territory of South Australia. Compiled in the Surveyor-General's Office, Adelaide, 1905. Scale 1 : 1,013,760 or 1 inch to 16 stat. miles. 3 sheets. Adelaide : Surveyor-General's Office, 1905. *Presented by the Surveyor-General of South Australia.*

Western Australia. **Dept. of Lands and Surveys, Perth.**

Map of Western Australia. Scale 1 : 1,584,000 or 1 inch to 25 stat. miles. 4 sheets. Perth : Department of Lands and Surveys, 1906. *Presented by the Surveyor-General of Western Australia.*

POLAR REGIONS.

Greenland. **Danish Survey Commission.**

Kort over Grönland udgivet af Commissionen for Ledelsen af de geologiske og geographiske Undersögelser i Grönland. Scale 1 : 2,000,000 or 1 inch to 31·6 stat. miles. 4 sheets. Copenhagen : Kommissionen for Ledelsen af de geologiske og geographiske Undersøgelser i Grønland, 1906. *Presented by the Danish Survey Commission.*

This is the best general map of Greenland that has hitherto been published. It is on a large scale, and shows the results of all recent expeditions. The printing is in four colours, and has been most carefully carried out. Heights of coast land and of the great ice-cap are given where they are known, but there are no soundings, which is, perhaps, to be regretted.

Swedish Arctic Expedition. **Nathorst.**

Svenska Polarexpedition under A. G. Nathorst, 1898–1899.—Karta öfver "Antarctica" Kurs under de svenska polarexpeditionerno 1898 och 1899.—Karte der Baie Recherche und Van Keulen Bay auf Spitzbergen. Scale 1 : 100,000.—Karta öfver Van Mijens Bay och Belsund. Scale 1 : 200,000.—Karta öfver Kung Karls Land. Scale 1 : 200,000.—Geologisk Karta öfver Kung Karls Land. Scale 1 : 250,000.—Karta öfver Konung Oscars Fjord och Kejsar Frans Josefs Fjord. Scale 1 : 500,000.—Karta öfver Beeren Eiland. Scale 1 : 100,000. Stockholm : Generalstabens. *Presented by Dr. A. G. Nathorst.*

A series of maps and charts, from various publications, showing the exploration and survey work in Spitsbergen and on the east coast of Greenland, accomplished by the Swedish Arctic Expedition of 1898–99, under the leadership of Dr. A. G. Nathorst. The first is a general chart of the North Polar basin between Greenland, Spitsbergen, and Norway, showing the complete track of the exploring vessel *Antarctic*, and the others are special charts and plans, as shown by the titles above.

GENERAL.

World. **Bartholomew.**

Atlas of the World's Commerce. A new series of maps, with descriptive text and diagrams, showing products, imports, exports, commercial conditions, and economic statistics of the countries of the world. Compiled from the latest official returns at the Edinburgh Geographical Institute, and edited by J. G. Bartholomew, F.R.G.S., F.R.S.E. Part vi. London : George Newnes, Limited. *Presented by the Publishers.*

World. **Philip.**

Philips' Model Duplex Maps. Nos. : 2, Asia ; 4, Australasia ; 6, South America ; 7, British Isles ; 8, England and Wales ; 9, Scotland ; 10, Ireland ; 14, the Indian Empire. London : George Philip & Son, Ltd. *Price 1d. net. each. Presented by the Publisher.*

Each of the above consists of two maps in one cover, one coloured to show political boundaries, and the other representing the relief as it would appear in the photograph of a model with a greatly exaggerated vertical scale. The idea seems good, but the exaggeration of the vertical scale is far too great.

World. **Stanford.**

Stanford's London Atlas of Universal Geography. Quarto Edition. Fifty coloured maps, and an alphabetical list of names with latitudes and longitudes. Sixth edition. London: Edward Stanford, 1906. *Price* 25*s*. *Presented by the Publisher.*

A new edition of a useful little general atlas, which was first published in 1882. No alteration has been made in the general arrangement of the maps, although one or two have been added. The bathy-orographical map of the world in hemispheres, the geological maps of Europe and the British Isles, and the orographical map of the British Isles, are worthy of special attention. A full index to place-names is given at the end of the atlas, with latitudes and longitudes, so that it is possible to locate the place on the map even if the name is not given on the map itself. The atlas may be obtained in 8vo size, bound in the same style and at the same price as the above, which is in quarto.

World. **Stieler.**

Neunten, von Grund aus neubearbeiteten und neugestochenen Auflage von Stielers Hand-Atlas. 100 Karten auf 200 Seiten mit 162 Nebenkarten in Kupferstich und einem alphabetischen Verzeichnis aller im Atlas vorkommenden Namen (ungefähr 240,000 Namen enthaltend) herausgegeben von Justus Perthes' Geographischer Anstalt in Gotha. Lieferungen 9–12. Gotha: Justus Perthes, 1906. *Price* 60 *pf. each part.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during June, 1906. *Presented by the Hydrographer, Admiralty.*

No.	Inches.	
2852 m	= 6·80	Ireland, west coast:—Sligo harbour and approach. 4*s*.
1875 m	= 0·5	North sea, Germany:—Elbe, Weser, and Jade rivers. 3*s*.
3570 m	= 7·29	Leeward islands:—Puerto Rico, Yabucoa harbour. 2*s*.
3572 m	= 2·42 2·40 5·27 1·44	West Indies:—Plans in Aruba, Buen-Ayre, and Little Curaçoa, Orangestadt to North point, Little Curaçoa, Paarden bay, Kralendyk road. 2*s*.
3111 m	= 4·85	Central America:—Colon harbour. 3*s*.
3569 m	= 1·62	Alaska:—Port Valdez. 2*s*.
3493 m	= 0·49	Bay of Bengal:—Cox's Bazar to Mayu river. 3*s*.
200 m	= 11·95	Adriatic coast of Italy from Ortona to the river Po. New plans:—Rimini entrance, Pesaro.
3523 m	= 6·0	British Columbia. Plans on the east coast of Vancouver island. Plan added:—Chemainus bay.
3334 m	= 1·96	Japan. Tokyo to Sendai bay. Plan added:—Onahama wan.
1020 m	= 8·97	Australia, east coast. Plan added:—Port Kembla.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
1875 North sea, Germany. Elbe, Weser, and Jade rivers.	New chart. Elbe, Weser, and Jade rivers	1875
513 West Indies. Plan of Orangestadt harbour on this sheet.	New plan. Orangestadt to North point on new chart	3572
3111 Central America. Colon or Navy bay.	New chart. Colon harbour	3111

Charts that have received Important Corrections.

No. 2045, England, south coast:—Owers to Christchurch with Spithead and the Isle of Wight. 1887, Germany:—Eider river to Blaavand point. 2990, France, north coast:—Le Havre and entrance to the Seine. 1306, South America, Magellan strait:—Plans in Barbara channel and Magdalen sound. 1373, South America, Magellan strait:—Tierra de Fuego, south-eastern part. 3327, Mexico, south-west coast:—Cape San Lucas to San Diego bay with the gulf of California. 1923*a*, British Columbia:—Cape Caution to Port Simpson, etc., northern portion. 1923*b*, British Columbia:—Cape Caution to Port Simpson, etc., southern portion. 2430,

Queen Charlotte island and adjacent coast of British Columbia. 1257, Korea:—Approaches to Ping Yang inlet. 1656, Korea:—Ping Yang inlet. (*J. D. Potter, Agent.*)

Indian Ocean and Red Sea. **Meteorological Office.**

Meteorological Chart of the Indian Ocean north of 15° S. lat. and Red Sea for August, 1906. London: Meteorological Office, 1906. *Price* 6*d*. *Presented by the Meteorological Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Meteorological Chart of the North Atlantic and Mediterranean for August, 1906. London: Meteorological Office, 1906. *Price* 6*d*. *Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for July, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for August, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Bombay Presidency. **Dwane.**

Twenty-three photographs of North Kanara and Bijapur Districts, taken by H. M. Dwane, Esq. *Presented by H. M. Dwane, Esq.*

These photographs have been presented by Mr. Dwane through Mr. F. J. Varley, in response to a request for geographical views of the peninsula of India.

(1) Back bay, Marmugao; (2) The headland, Marmugao; (3) Boatmen cutting up fish in the breakwater, Marmugao; (4) Scene at Vasco da Gama bay, south side, looking out to sea; (5) The landing-place, Downapowla; (6) The Fort moat, Bijapur; (7) The Boli Gombez, Bijapur; (8) Old cannon, Bijapur; (9) View 2 miles from Castle Rock railway station; (10) View from S.M. railway bungalow, 2 miles from Castle Rock station; (11) Dugh Sagar station, West of India-Portuguese railway; (12) Dharwar fort gate; (13) A well, Dharwar; (14) Dharwar bazaar; (15) Approach to main gate, Dharwar fort; (16) Inner gate, Dharwar fort; (17) The bottle dealer, Dharwar bazaar; (18) The money-changer, Dharwar bazaar; (19) The spice-sellers, Dharwar bazaar; (20) The rice-sellers, Dharwar bazaar; (21) The miscellaneous bazaar, Dharwar; (22) The vegetable-sellers, Dharwar bazaar; (23) The village boot-maker mends boots while you wait, Dharwar bazaar.

Mysore. **Barton.**

Seven photographs of the Elephant Keddah, arranged for the Prince of Wales in Mysore, in February, 1906, taken by Messrs. Barton, Son & Co., Bangalore. *Presented by the Right Hon. Lord Curzon of Kedleston, G.C.S.I., G.C.I.E.*

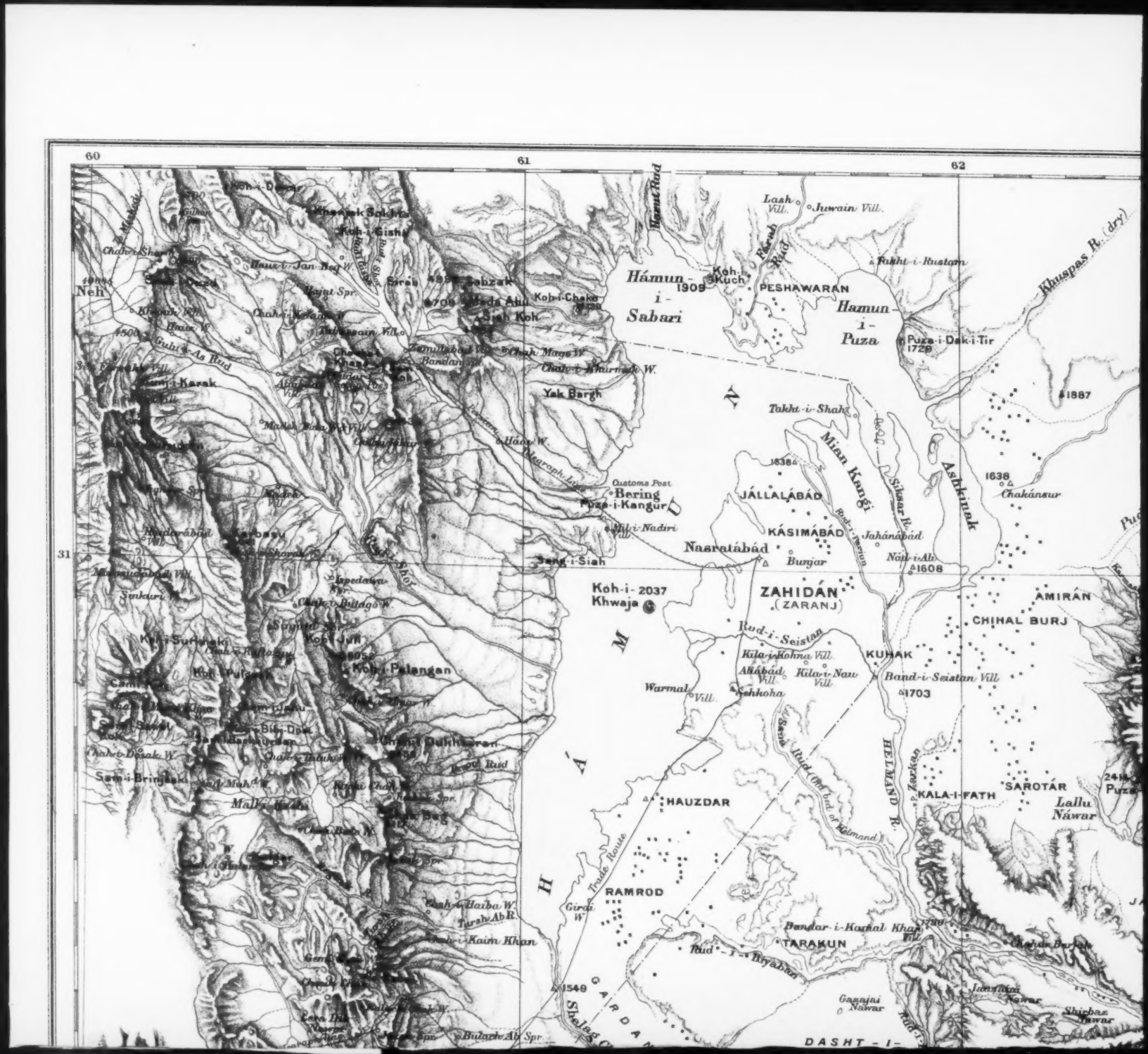
An interesting series of platinotypes, of different sizes. The titles are as follows:—

(1) Elephants in the outer stockade, the beginning of the drive; (2) Elephants entering the Keddah from the outer stockade; (3) The "koomkies" entering the inner stockade; (4) The koomkies punishing a troublesome cow; (5) A captured elephant being taken to water; (6) Tying up a big tusker; (7) The tusker hobbled and secured to a post.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Dritte Reihe, Heft 7 u. 8. Vegetationstypen von der Insel Koh Chang im Meerbusen von Siam. Von Dr. Johs. Schmidt. Vierte Reihe, Heft 1. Ameisenpflanzen des Amazonasgebietes. Von E. Ule. Jena: Gustav Fischer, 1906. *Price* 2.50 *marks each part.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


60
61
62
31
Koh-i-Dosak
Khaisak Sakhta
Koh-i-Gishu
Chah-i-Shaikh
Haus-i-Jan Beg W.
Sarab
Sabzak
Neh
Hamun-i-Sabari
Koh-i-Kuch
1909
PESHAWARAN
Hamun-i-Puza
Puza-i-Daki-Tir
1729
Khuspas R. (dry)
Hamun Rud
Lash Vill.
Juwain Vill.
Farah Rud
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Koh-i-Chaka
Siah Koh
Chah-i-Kalang W.
Zamulkabad
Bandan
Chah Mago W.
Chah-i-Shurmak W.
Yak Bargh
Takht-i-Shah
1887
Guhl-i-Ab Rud
Karak
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Telegraph Line
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Bering
Puza-i-Kangur
Mian Kangi
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Ashkinak
1638
Chakansur
JALLALABAD
KASIMABAD
Jahanabad
Nasratabad
Bunjar
Nau-i-Ab
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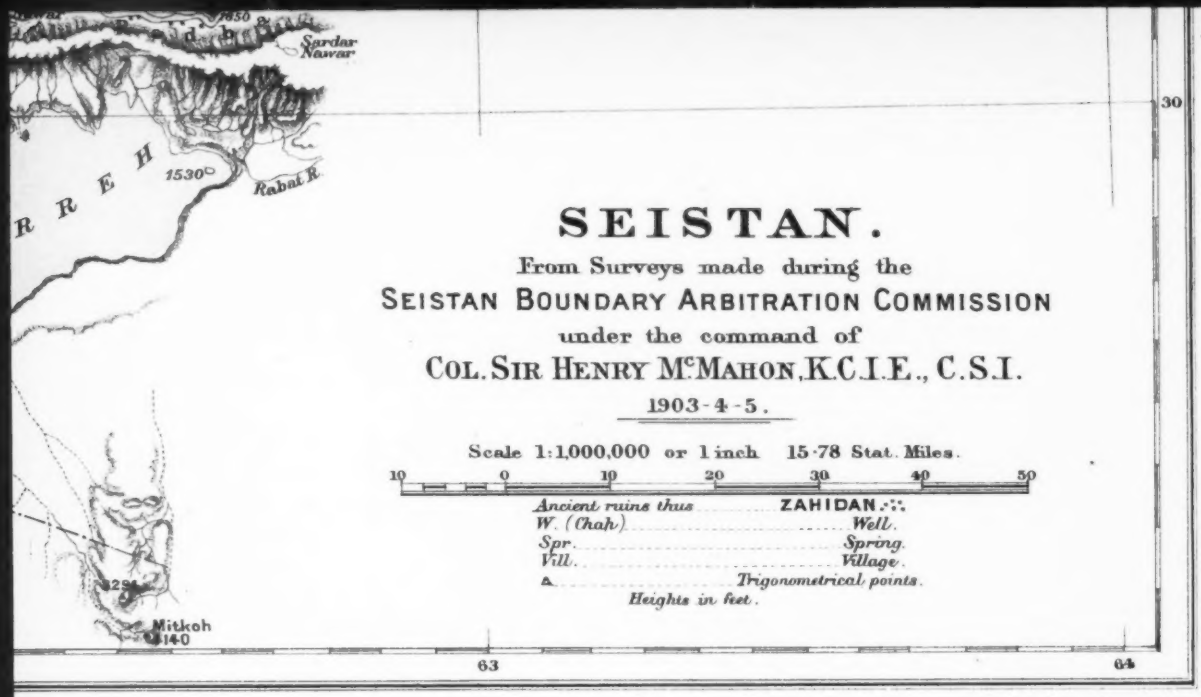
Sang-i-Siah
Koh-i-2037
Khwaja
ZAHIDAN
(ZARANJ)
AMIRAN
CHIHAL BURJ
Rud-i-Seistan
Kila-i-Kohna Vill.
KUHAK
Abadad Vill.
Kila-i-Nau Vill.
Band-i-Seistan Vill.
1703
Warmal Vill.
Kohkoha
Koh-i-Palangan
Koh-i-Pufak
Koh-i-Jun
Sam-i-Bringaki
Mallu-Dadda
HAUZDAR
KALA-I-FATH
SAROTAR
Lallu Nawar
HELMAND R.
Zaskan
Sand Rud (Old bed of Helmand)
RAMROD
Trade Route
Girdi W.
Chah-i-Haiba W.
Tarah Ab R.
Chah-i-Kaim Khan
Bandar-i-Kashal Khan
TARAKUN
Rud-i-Biyaban
1549
Gazgai Nawar
Jamalkai Nawar
Shibaz Nawar
DASHT-I-

SEISTAN.
Mc MAHON.

Conical Projection with two Standard Parallels

Published by the Royal Geographical Society



SEISTAN.

From Surveys made during the

SEISTAN BOUNDARY ARBITRATION COMMISSION

under the command of

COL. SIR HENRY McMAHON, K.C.I.E., C.S.I.

1903-4-5.

Scale 1:1,000,000 or 1 inch 15·78 Stat. Miles.

10 0 10 20 30 40 50

Ancient ruins thus ..... ZAHIDAN.∴

W. (Chah) ..... *Well.*

Spr. ..... *Spring.*

Vill. ..... *Village.*

△ ..... *Trigonometrical points.*

Heights in feet.